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Special Volume

Indian Ocean in Antiquity

Guest Editor
Sunil Gupta

Indian Society for Prehistoric and Quaternary Studies

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Cover: Mediterranean flagon from Elephanta Island, India

Editorial

The idea of this volume sprang up in the hubbub of an evening get together, during the annual conference of ISPQS at Delhi in December 2000. No intense deliberations or forward planning preceded the venture. I agreed to the proposition with trepidation, knowing fully well the silences that may greet one demanding energy and time from scholars. I was enthused when my emails and letters began to elicit responses, of course not all of them pretty. At least there was not the dreaded silence. The idea of the *Indian Ocean in Antiquity,* I realized, was not a chimera after all. This is how it has happened, the special issue of the *Man and Environment*, pretty much on its own.

The sixteen research papers in the volume are fairly representative of the early Indian Ocean world. Contributions on the western sphere focus upon the role of Red Sea ports in the ancient Indian trade, pre-Iron Age linkages of Yemen and integration of Eastern Africa into pan-oceanic networks. Articles on external contacts of Early Historic India as well as Sri Lanka and the Maldives cover the Indian subcontinent. Outreach processes in the eastern Indian Ocean are investigated through analysis of trade potteries. There are review papers as well, seeking pan-oceanic perspectives.

This volume constitutes the third collection of writings on the archaeology and history of the early Indian Ocean world within a decade. Julian Reade edited the first compendium, the namesake of the present issue (*The Indian Ocean in Antiquity* 1996. London: Kegan Paul International). It brings together the proceedings of a seminar held in the British Museum in 1988. The second collection edited by H.P. Ray and J-F. Salles (*Tradition and Archaeology, Early Maritime Contacts in the Indian Ocean* 1996. Delhi: Manohar) comprises selected papers read at an international seminar hosted in 1994 by the National Institute for Science, Technology and Development Studies, New Delhi. I believe that a good quantum of archaeological data on the Indian Ocean world now exists. Transmissions of botanical and animal domesticates have been traced along the Indian Ocean rim; ancient harbours and trade routes identified on the ground; a range of exotic artefacts recorded, and diffusion of techno-cultural traditions (art, watercraft, metallurgy) observed in the material cultural record. This corpus needs to be integrated into theoretical frameworks. We can now speak of Indian Ocean Archaeology as a specialisation, like Harappan Studies or Mediterranean Archaeology.

I take this opportunity to thank our contributors. I hope they will be forgiving of our lapses. I also thank the ISPQS and the Editorial Board of the *Man and Environment* for providing a forum for Indian Ocean Archaeology. Finally, a moment to remember some of those who made the Indian Ocean idea possible. The venerable late Krishna Deva, who assisted the great Mortimer Wheeler at Arikamedu, in drawing the long and robust amphorae forms which appear in *Ancient India 2*. I had listened with rapt attention as he once told me his experiences in the field, especially of the bandit's bullet that grazed his thigh in the wastes of Sind; and Late Vimala Begley, who continued Wheeler's work at Arikamedu. I had sought her out in Pondicherry, seeking guidance for a doctoral program on Indo-Roman sea trade. I vividly recall the time we walked the palm-lined boulevards of this Indo-French town, her words of advice carried by winds from the Bay of Bengal. To Krishna Devji and to Vimala, who were with us not so long ago, I pay my respects.

Sunil Gupta
Guest Editor

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The Archaeo-Historical Idea of the Indian Ocean

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Abstract

This paper attempts to consolidate the early Indian Ocean world within an archaeo-historical framework. Drawing from the Braudelian principle of *la longue duree* (the long haul) the endeavour is to view events, episodes and material culture processes along the Indian Ocean rim in deep time perspective (5th/4th millennium B.C. to early 1st millennium A.D.). Notional stages in the emergence of the Indian Ocean Interaction Sphere are outlined. The paper also touches upon key conceptual and methodological themes relevant to the historical construction of the Indian Ocean in Antiquity.

Introduction

The Indian Ocean stretches from the Red Sea to the South China Sea, incorporating the core littoral regions of the Arabian Sea and Bay of Bengal. The monsoons - wind systems that seasonally reverse direction - define the environment of this maritime space. The littoral regions of the Indian Ocean witnessed prehistoric migrations, dispersals of flora and fauna, emergence of some of the greatest civilizations (Mesopotamia, Indus, Southern Arabia), development of maritime technologies and spread of trade networks. The Indian Ocean in antiquity was therefore much more than a watery outlier. While there have been recent attempts to historically consolidate the early Indian Ocean world (Reade 1996; Ray and Salles 1996), the material cultural processes on the littorals are still thought of as marginal to those which created large riverine civilizations in the interiors. The oblique reference to the Indian Ocean by the archaeologist Gordon Childe is a typical perspective: 'Egypt, Sumer and the Punjab lie in the valleys of great permanent rivers that traverse a more or less continuous desert plateau… the Indian Ocean forms the southern limit of our zone.' (Childe 1952: 14-15).

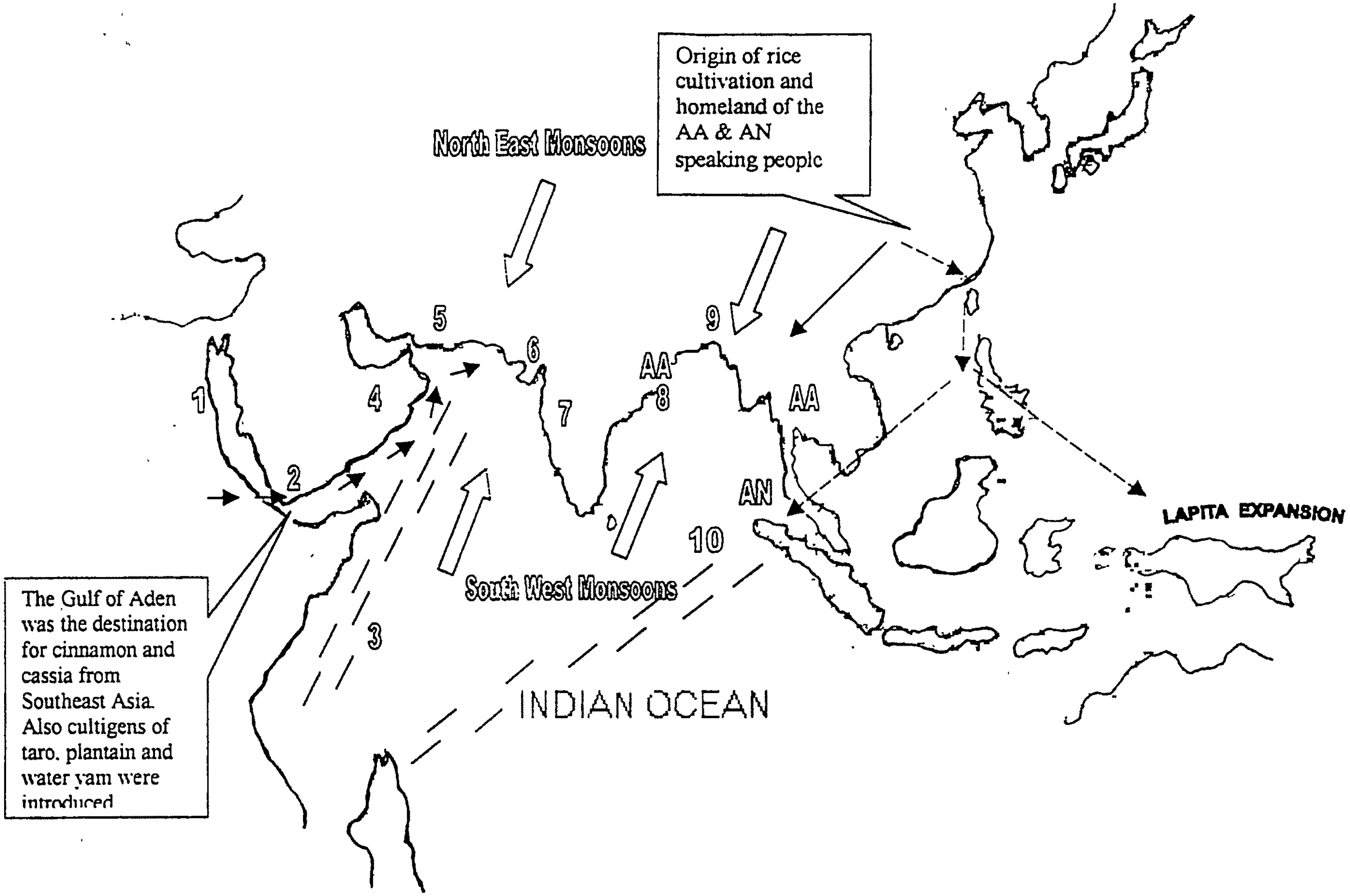
We shall seek to cross that limit. The Indian Ocean is perceived here as an interactive sphere that developed in time, emerging as a complement to civilisation processes on mainland Asia. The proposition engages us primarily with 'mute' records, largely archaeological. The early Indian Ocean world is viewed in deep time perspective: from 5th/4th millennium B.C. to early 1st millennium A.D. In the first part of the paper, I have delineated 'notional stages' in the making of the Indian Ocean Interaction Sphere. The stages are notional in the sense that they reflect a bias in selection of data. Also, the fact that the database is highly dynamic and revisions would be expected. The term 'notional' implies that explication of the stages is an 'open-ended' exercise and that alternative constructions are just as possible. The second part of the paper addresses key conceptual and methodological issues relevant to the archaeo-historical idea of the Indian Ocean.

Notional Stages

Expansions, Dispersals and Nascent Networks (5th-4th millennium B.C.)

Western Indian ocean

Dispersals of botanical and animal domesticates offer insights into early settlement processes and growth of incipient exchange networks along the Indian Ocean rim. The spread of millets 'Out of Africa' is perhaps the most illuminating episode in this regard.[1] The dispersal theory postulates that millet cultivars — of sorghum in particular — began to spread into West Asia from native habitats in sub-Saharan Africa in the 5th millennium B.C. (Harlan 1993: 53-60). The route of transmission as constructed by Harlan (in Possehl 1997: 87-100) crossed the southern Red Sea in the vicinity of the Bab el-Mandeb (straits which connect the Red Sea to the Gulf of Aden) and touched the Tihama coast of western Yemen, thence diffusing into southern Arabia/Yemen (Fig. 1). Evidence for cultivated sorghum occurs in southwest Yemen in contexts dated to 3000 B.C. (Edens 2002: this volume). A pottery vessel with impressions of sorghum dated to 2500 B.C. has been found in highland Yemen (Harlan 1993: 53-60). The emergence of agriculture in Yemen as early as 4th millennium B.C.



Origin of rice cultivation and homeland of the AA & AN speaking people

The Gulf of Aden was the destination for cinnamon and cassia from Southeast Asia. Also cultigens of taro, plantain and water yam were introduced

Fig. 1: Botanical dispersals and human expansions in the Early Indian Ocean World (5-3 millennium B.C.)

(Edens *et al.* 2000: 854-62) must have provided fertile ground for early cultivation of sorghum in southern Arabia. In Oman — the crucial link between south Arabia and India — sorghum has been recovered from contexts dated to 2330-2250 B.C. at Hili 8 (Clueziou and Tosi 1989: 15-47).[2] According to Weber (1998: 267-274), millets of African origin entered the Indian food chain in two phases. The first phase of dispersal brought the finger millet to western India around mid- third millennium B.C. The second phase in early 2nd millennium B.C. saw infusion of the large millet (*Sorghum bicolor*) and the pearl millet. We can envisage a 'staggered' transmission of millet domesticates from Yemen to Oman and further east into the Indian Subcontinent, the process spread out from 3000-2000 B.C. (for overviews see Wigboldus 1996: 75-84; Possehl 1997: 87-100).

Here, it is important to distinguish between processes of dispersal and beginning of cultivation of sorghum along the Arabian Sea rim. The chronological range suggests that sorghum cultivation was already established in Arabia-India by mid-late 3rd millennium B.C. Allowing time for the processes of dispersal, which preceded full fledged cultivation of sorghum in Arabia, there is a lag of more than a millennium between the first dispersal of sorghum and evidence for its cultivation in the Arabian peninsula and the Indian subcontinent. The point is that early contacts along the Arabian Sea rim are associated with dispersals, in the centuries preceding the beginning of cultivation, the 4th millennium B.C. being the likely period. The significance of the 'dispersal period' is underscored by Cleuziou and Tosi (1989: 53) with regard to the Omani middle ground: 'Although we assume that very few artefacts travelled to and from Oman till the very end of the 4th millennium B.C., plants, animals and people moved around and were introduced into the country.'

It is an open question whether the Arabian coastlands and Makran–Sind–Gujarat (western seaboard of the Indian subcontinent) were linked by a *regular* exchange network in these early times. The excavators of the shell midden RH5 in Oman report intrusive wood remains of probable Baluchistan source in 4th millennium contexts. However, they go no further than calling this driftwood (Biagi *et al.* 1989: 1-8). The early occupation of the Makran coast of Baluchistan is indicated by basal levels at Miri Qalat tentatively dated to late 5th millennium B.C. (Besenval 1997: 199-216). Excavations at the site of Balakot on the Sind coast reveal occupation starting in early 4th millennium B.C. (Frank-Vogt 1997: 217-235). Miri Qalat and Balakot seem to have been settled by pastoral groups from interior of Baluchistan. Further east, the Gujarat coast was settled by Chalcolithic communities, very likely from north Gujarat, sometime in the 4th millennium B.C. (Possehl 1999: 611-14). Poesshl suggests that some of the pottery from earliest levels of Prabhas Patan on the Saurashtra coast of Gujarat may be of Arabian provenance. To quote: 'It shares nothing with Burj basket-marked, Togau or Kechi Beg ceramics. It is certainly not Amri-Nal assemblage. In the end we do not know very much about the people who made and used the Pre-Prabhas ceramics. It seems clear that they are part of the early 3rd millennium B.C. and that some of their pottery lies outside the Amri-Nal tradition. It may be that their origins lie in Arabian Gulf or Saudi Arabian coast...' (Possehl 1999: 613-14). Shinde (1998: 173-82) finds some of the pottery in the basal levels at Padri on the Gulf of Khambhat littoral similar to Baluchistan–Sind Chalcolithic horizon of early 3rd millennium B.C. The ceramic indicators suggest that the Makran–Sind–Gujarat coastlands were occupied by communities, which had adopted a maritime lifestyle and had initiated contacts along the western seaboard of the subcontinent and beyond.

Early watercrafts operating along the Arabian–Persian–Indian coastlands must have been crucial for dispersal of millet cultivars. In the Oman and the Persian Gulf region, rowboats without sails were probably the first watercraft to be used by early sedentary communities. Bas-relief representations of rowboats have been found on the rock outcroppings at Jebel Jusasiyah on the island of Qatar. The carvings are presumed to be of protohistoric date (Nayeem 2000: 372-75). Ethnographically, the boats depicted at Jebel Jusasiyah are similar to the *sasha,* a row boat made out of palm leaf ribs and in use on the Oman coast till recent times (Heyerdahl 1982). Certain (wood planked?) watercrafts seem to have been caulked with bitumen in Oman–Persian Gulf since early 4th millennium B.C. Sumerian literary records of early 2nd millennium B.C. refer to ceremonial boats caulked with bitumen plying in water channels between Eridu and Uruk. Zarins (1992a: 60-65), discussing the evidence, contends that a freshwater lake (on the banks of which the settlement of Eridu was located), became gradually desiccated and was abandoned following the Eridu occupation in the Early/Middle Uruk period, *c.* 3700-3400 B.C. Going by this evidence, we can infer that the 2nd millennium Sumerian records allude to a time in the 4th millennium B.C. when the boats caulked with bitumen sailed the waters off Eridu. A clay model of a sailing vessel was excavated from Ubaid levels at Eridu (Barnett in Ratnagar 1981). Evidence from archaeology shows prolific use of bitumen as insets for implements and for making decorative objects in the Ubaid-Uruk contexts at Eridu (Zarins 1992a: 65). On the Oman coast, bitumen has been found at the RH5 midden on the Batinah coast, in context dated to the late 4th millennium B.C. (Cleauziou and Tosi 1989: 28-29). The evidence of bitumen from RH5, in the form of tar at the base of a pot, has been interpreted by archaeologists in the field as binding material for watercraft (Cleuziou and Tosi 1989: 30) That boat making technology may have diffused from Ubaid centres in the upper Gulf to Oman remains a possibility, especially when faint outlines of exchange mechanisms in the Persian Gulf are visible in 4th millennium B.C. (Al-Ansary 1996: 238-245). Post-Ubaid settlements dated to mid 4th millennium B.C. has been discovered in eastern Arabia, the transition area between the upper and lower Gulf (Zarins 1989: 74-103). Bitumen caulking of boats became established early in the Gulf-Oman littorals and we cannot dismiss the possibility that these vessels were used for crossing the Sea of Oman to India in such early times. Excavations at Ras al-Junayz, fishing and trading station of the Wadi Suq period (3rd-2nd millennium B.C. transition) on the Oman coast, have yielded some hundred pieces of bitumen from a room floor. The bitumen pieces carry impressions of rope and matting and are encrusted with barnacles, indicating sailing in the high seas (Newsletter of the Joint Hadd Project 1987). Articles of trade of Harappan provenance were recovered from Ras al- Junayz, suggesting that mariners from Ras al- Junayz made the crossings to the Indian subcontinent. Though Ras al- Junayz flourished during the 3rd-2nd millennium transition, much later than the period under review, the archaeological and ethnoarchaeological record suggests that deep sea voyaging in the Sea of Oman must have had long antecedents.

The outline of maritime activity and dispersal of plant domesticates indicates that *conditions* for extended coastal networks to function had emerged in the 4th-3rd millennium B.C. transition along the western Indian Ocean rim. The knowledge of the monsoon regime, the seasonal switching of wind and current directions, must have been exploited for long movement of watercraft in coastal waters. It is under circumstances of growing interactivity along the Arabian Sea rim that the first infusion of millet cultigens into western India took place. The 'marine communities' inhabiting the south Arabian (Tihamah), Oman (Batinah) and Makran–Sind–Gujarat coasts were the likely agents for dispersal of cultigens along the Arabian Sea rim. The incipient coastal networks established by these prehistoric communities anticipated the highly organised Bronze Age trade conduits in the western Indian Ocean in 3rd-2nd millennium B.C.

Eastern Indian ocean

Archaeology and Language form the basis for a powerful concept explaining human expansions in prehistory in the eastern Indian Ocean region. The hypotheses holds that native stone age (Hoabinhian) communities inhabiting Southeast Asia were initiated into sedentism by Mongoloid communities migrating from their 'homeland' in the Yangtze Valley/southern China (for overview see Bellwood 1992). The Mongoloid communities were said to possess superior agricultural technologies, particularly rice cultivation techniques. The beginning of rice domestication has been pushed back to 12,000-10,000 BP in the middle-lower Yangtze basin (Yasuda 2001). These recent discoveries, and the fact that evidence of rice cultivation has been uncovered at Yangtze sites like Hemudu (dated 7000 BP), gives credibility to the Austric homeland idea (for early rice see Yasuda 2001; for Austric language area see Blust 1996: 117-140; Reid 1988: 19-34). According to Bellwood (1992), the spread of Neolithic culture from southern China took place along two spatial trajectories, one overland into mainland Southeast Asia and eastern India and the other maritime, exploiting sea routes from Taiwan into island Southeast Asia (Fig. 1). The conduits that opened from southern China in the 5th-4th millennium B.C. introduced, together with agricultural technologies, two major linguistic strains: the Austro-Asiatic (AA) and Austronesian (AN) languages. The lines of migration are indicated by a progressive reduction of dates for beginning of rice cultivation in the AA and AN speaking regions as one moves south of the hypothetical Chinese homeland (Bellwood 1992).[3] Interestingly, each of the expansionist trajectories (AA speakers into mainland SE Asia; AA speakers into eastern India; AN speakers into island SE Asia) expended themselves about the Bay of Bengal. The Bay of Bengal was as much a part of the Southeast Asian realm as it was of the Indic world. Within this dynamic maritime area fundamental techno-cultural processes are observed: movement of ethnic-linguistic communities, opening of land-sea routes and ports, innovations in boat building and navigational technologies and refining of foraging and agricultural skills (discussion below).

Therefore, across the Indian Ocean as a whole, human expansions, the dispersals of animal/plant domesticates and growth of incipient coastal networks were closely linked processes in the 5th-4th millennium B.C. This maritime space opened up access to new technologies, routes and resources for interaction between Old World Civilizations.

Long Distance Exchange and Interchange Processes (3rd-1st millennium B.C.)

Trade networks primarily circulating crafted jade emerged in southern China in the 3rd millennium B.C. (Huang 1992: 75-83). From mid 2nd millennium B.C., Austronesians based in the Sulawesi Sea region began to cross the vast stretches of sea to settle South Pacific islands (Bellwood 1992). Austronesian seafarers also set their sights west, towards the Indian Ocean proper (see Archaeology and Language section below). In the western Indian Ocean region, the Bronze Age polities of Egypt, Mesopotamia and the Harappan/Indus-Saraswati consolidated their presence on the coastlands, 'appropriating' littoral communities to new concerns and ambitions. Two major episodes of sea trade during the 3rd-2nd millennium B.C. exemplify the First Maritime Tradition in the Indian Ocean: the Harappan–Mesopotamian engagement across the northern Arabian Sea and in the Red Sea, the trade between Pharaonic Egypt and the myrrh producing land of

Punt (Yemen in all likelihood; Gupta 2001a). The quest for high value goods inspired the Bronze Age Egyptians, Mesopotamians and Harappans to develop staging areas for long distance maritime exchanges. The first trade ports of the Indian Ocean were thus founded. On the Egyptian Red Sea coast, Egyptian archaeologists have discovered a 12th Dynasty port (1943-1898 B.C.) at Wadi Gawasis (location 1 in Fig. 1). An inscription on a stela found at Wadi Gawasis informs of a commercial voyage to the land of 'Bia-Punt' carried out from this Pharaonic port (Sayed 1993: 41-72). In the Persian Gulf region, major ports of trade came up at Ur in Mesopotamia/upper Gulf; Bahrain in the middle Gulf (ancient *Dilmun*) and Umm an Nar and Ras al- Junayz in the lower Gulf (ancient *Magan*) (for consolidated information see Potts 1990). In the western littoral of the Indian subcontinent (Makran–Sind–Gujarat coastlands/ancient *Melluha*), Harappan harbours were founded at Balakot (Sind), Kuntasi (Gulf of Kachchh) and Lothal (Gulf of Khambhat) (for consolidated information see Possehl 1999). The fortified Harappan settlements of Suktagendor and Sokta Koh on the Makran coast, though not harbours, controlled the approaches to the Gwadar and Pasni anchorages opposite the Oman littoral (Dales and Lipo 1992). The Harappan interchange with the Gulf societies is known mainly through deposition of exotic artefacts: ceramics, weights, seals, carnelian beads etc. The evidence has been copiously documented and discussed.[4]

The Harappan de-urbanisation process, which saw a return to a rural way of life for the inhabitants of the Indus-Saraswati valleys by mid 2nd millennium B.C., also led to the rapid decline of the Indo-Gulf sea trade. In the Red Sea, the Egyptian trade with Punt flourished through the 2nd millennium B.C. but the hieroglyphic references to Punt are erratic in the 1st millennium B.C. The land of Punt becomes an abstract geographical nomenclature by the time of the Ptolemaic Greeks who ruled Egypt in the latter part of the 1st millennium B.C. (Kitchen 1993: 602). However, the decline of the elite trading systems in the western Indian Ocean did not snuff out the local/regional coastal networks functional since Neolithic times. These perennial modes of exchange remained in place, long attuned to movement of essential commodities. Deposition of Late Harappan pottery in Oman indicates that food exports from the rich agricultural regions of Gujarat continued in Chalcolithic times (Cleuziou 1992: 93-103). A robust 'dhow trade' still supplies Indian foodstuffs (onion, meats) from small harbours in Gujarat–Maharashtra to the Oman peninsula (Sahani 1997: 9-18). It is also to be noted that the lesser-known coastal networks extended beyond the main trade conduits. For instance, a copal pendant found in funerary contexts at Tell Asmar may have come from Mozambique, indicating that routes were open all the way to the Swahili coast during the 3rd-2nd millennium B.C. (Possehl 1997: 87-100). Edens (2002: this volume) discusses the case for Neolithic and Bronze Age exchange networks linking south Arabia with the Red Sea, eastern Africa and the Persian Gulf between 4000 and 1000 B.C.

The Iron Age commences between early-mid 1st millennium B.C. in most parts of the Indian Ocean region.[5] Ports and urban settlements reappear on the Indian coastlands around mid 1st millennium B.C., nearly a thousand years after the Harappan harbours had faded into obscurity. A number of Iron Age settlements on the western coast of India are founded on or near Harappan sites: Dwarka, Bharuch and Prabhas Patan in particular (see Encyclopaedia of Indian Archaeology Vol. II [Ghosh 1989] for review of stratigraphy). The maritime revival was fuelled by the urbanisation of the Gangetic heartland where Iron Age polities called *mahajanapadas* (that rose in the early 1st millennium B.C.) sought outlets to the sea (for Gangetic urbanisation see Lal 1984; Jha 1998). Across the Arabian Sea, the Iron Age of south Arabia saw the rise of fortified urban centres in early 1st millennium B.C. (de Maigret *et al.* 1985, 1986). Between 500-0 B.C. powerful south Arabian littoral kingdoms had extended their reach to Egypt, east Africa, Persian Gulf and India (van Beek 1958: 141-52; see writings on South Arabia in Cimino 1994). The Greek sea guide *Periplus Maris Erythraei* informs that the south Arabian port of Eudamon Arabia (modern Aden), which flourished in 3rd-2nd century B.C., functioned as the primary trans-shipment point for goods from the Mediterranean lands and India (Schoff 1912; Casson 1989). In the Persian Gulf, the Achaemenids expanded their power along the Oman coast, despatching merchant vessels to western India in the 4th century B.C., a policy of engagement continued by Seleucids and Parthians in the B.C.-A.D. transition (Salles 1996: 251-68; Potts 1996: 269-86). In the eastern Indian Ocean, the Austronesian expansions reached the edge of the Bay of Bengal, near the Malaysian peninsula and Sumatra in western Indonesia. The last of the Austro-Asiatic expansions — represented by the Ban Kao Neolithic culture — also occur along the Malaysian peninsula (Bellwood 1992; Higham and Thosarat 1998). Finds of Indian artefacts are confirmed at the Late Prehistoric site of Ban Don Ta Phet in Thailand in contexts dated to 4th century B.C. and beads (especially carnelian spheroids and barrels). Indic beads are also found in 'pre-Oc Eo' contexts about the Gulf of Thailand.[6]

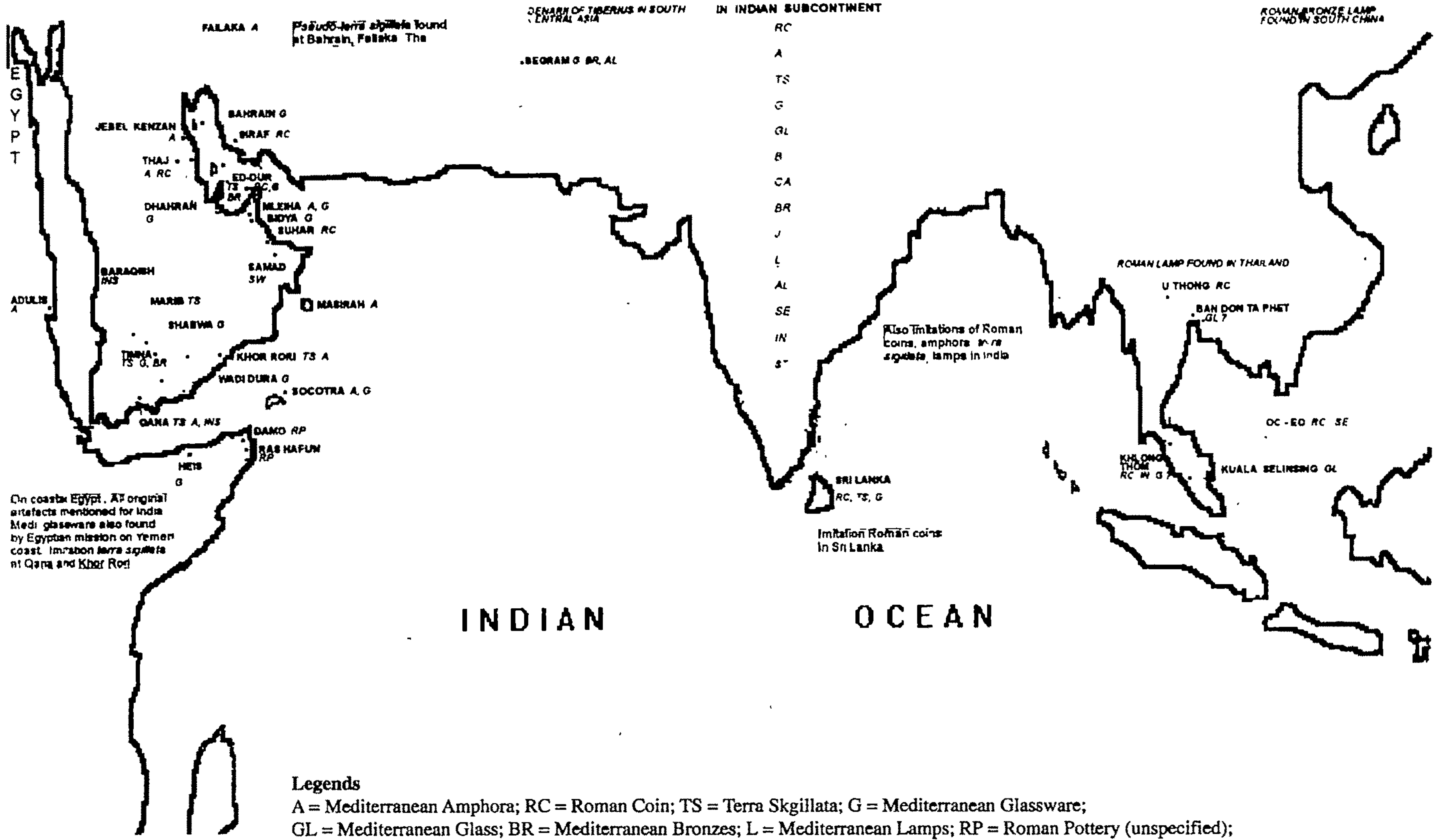
The close of the 1st millennium B.C. saw increasing integration of the littoral regions of the Indian Ocean, primarily due to the spreading knowledge of the monsoons and development of maritime technologies (navigation aids, ships) designed to exploit the monsoon phenomena for deep sea voyaging. The Iron Age networks which emerged between 500-0 B.C. ushered the Second Maritime Tradition in the Indian Ocean.

The Indian Ocean Interaction Sphere (Early 1st millennium A.D.)

In the beginning of the Christian era we find various maritime entities (Greco-Roman, Arabian, Persian, Indian and Southeast Asian) engaging each other in the Indian Ocean. The knowledge of monsoon voyaging is now 'universal'. The opening of the Silk Route of the Sea is a significant episode in the integration of the Indian Ocean world (Gupta 1994a). The sea route, connecting the Indian Subcontinent to the Mediterranean region via the Red Sea was the maritime complement of the overland Silk Route emerging out of Central Asia, traversing the Iranian highlands to the Mediterranean world. The sea route opened due to (a) the Roman-Parthian conflicts that disrupted flow of goods along the overland conduits and (b) the Roman conquest of Egypt in 31 B.C. (Warmington 1928; Wheeler 1954). The latter event brought the Roman frontiers to the Red Sea and opened new commercial possibilities. Ptolemaic period ports on the Red Sea coast of Egypt were refurbished by Roman authority and land routes from the Nile to the coast were provided with watch towers and watering stations (Sidebotham 1986; Zitterkopf and Sidebotham 1989: 155-89). The fairly detailed list of ports and coastal settlements along the Indian Ocean rim provided in Greek records such as the Periplus Maris Erythraei (1st century A.D.) and the Geographia of Ptolemy (2nd century A.D.) reflect more than western geographical curiosity about the Orient.[7] Excavations at the Roman-Egyptian harbours of Berenike (Sidebotham and Wendrich 1995-2000) and Myos Hormos (modern Quseir) (Peacock *et al.* 1999, 2000, 2001, interim reports) have brought to light rich material evidence of trade with Arabia and India. The south Arabian Iron Age ports at Bir Ali (Periplus' Kane Emporium in Yemen) and Khor Rori (Periplus' Moscha Limen in southern Oman) were founded in the beginning of the Christian era to take advantage of new opportunities offered by Roman mercantilism.[8] These ports, under the direct control of Hadhramauti rulers, traded in frankincense and offered berthing facilities for ships from Roman Egypt crossing the Arabian Sea to and forth from India (Yule and Kervran 1993: 69-106; Sedov 1996: 11-35). Excavations by Russian archaeologists at the port-site of Qana have revealed that imported wares (largely amphorae from the Mediterranean rim) were in greater percentage than indigenous south Arabian potteries (Sedov 1992: 10-37, 1996: 11-35). On the Indian subcontinent, coastal settlements and ports came up or were expanded in B.C.-A.D. changeover. The Greek records are a testimony to the rapid opening of the Indian coastlands in the early centuries A.D. Archaeological fieldwork undertaken to locate the 'Periplus' ports reveals that Early Historic trading stations and harbours flourished in diverse environments. Large entrepots like Bharuch (Periplus' Barygaza-on-Narmada) and Kaveripattinam (Ptolemy's Khaberis Emporium) were situated on river estuaries; ancient harbours at Chaul (Periplus' Semylla) and at Kuda (Periplus' Mandagora) were situated near deep creeks and anchorages like Arikamedu (Periplus' Poudouke) in lagoonal settings.[9] At the pan-Oceanic plane, Roman mercantilism is indicated by 'sudden' appearance of Mediterranean artefacts across the Indian Ocean in the early centuries A.D. (Fig. 2). The deposition of certain artefact types, like the Dressel 2-4 amphorae, in ancient port-sites and settlements along the Egypt – India sea route signify Indo-Roman trade dynamics in archaeological terms (Gupta 1994b; Gupta *et al.* 2002: 7-18; for 'pre-Periplus' trade see Begley 1992: 157-96).

It may be noted that the term 'Roman' is a generic category for myriad ethnic and linguistic mercantile and seafaring communities based in the Roman Empire and involved in the Indian Ocean trade (for discussion on the term 'Roman' see Wheeler 1954 and Gupta 1997; for trading communities in Roman Egypt see Sidebotham 1986; also Raschke 1978). While Roman maritime activity is 'conspicuous' in the Indian Ocean, it is a moot point whether this visibility is because of the bias caused by copious archaeo-historical data on the trade or because of the overwhelming logistics of Roman mercantilism itself. Coningham (2002: this volume) offers a critique of the views advanced by the English archaeologist Mortimer Wheeler on the Indo-Roman engagement. The Wheeler Model is built on the premise that Roman maritime contact activated the 'leisurely and unenterprising' coastal settlements on the Indian peninsula. Roman contact did have a beneficent impact on material culture and ideas (adoption of Alexandrian horoscopic precepts for instance). The results of Wheeler's excavation at the 'Indo-Roman trading station' of Arikamedu on the east coast of India (Wheeler *et al.* 1946) are still significant for understanding — within a stratigraphic context — economic exchange and urbanisation processes in peninsular India (Gupta 1996b: 50-61; Gupta 1998: 87-102). However, (and here I agree with Coningham) the Roman maritime initiative was not the prime causative factor for the making of the Indian Ocean Interaction Sphere. Rather, in the early centuries A.D., Roman mercantile interests took advantage of long established trans-oceanic conduits, like the Indo-Southeast Asian and the Indo-Persian Gulf networks active since mid 1st millennium B.C. Within the Indian subcontinent, the domestic exchange networks, especially the trade routes reaching the sea, must have provided ready means of commodity transfer to and from the hinterlands for merchants from overseas (Smith 2002: this volume). This is suggested by the 'regular' deposition of Roman artefacts along the documented trade routes of Early Historic India (Fig. 3; for early trade routes see Lahiri 1992).

A 'fuller' picture of interchange in the Indian Ocean during the B.C./A.D. transition can only emerge with the elucidation of 'non-Roman' exchange networks. As Fig. 4


EGYPT
FAILAKA A
Pseudo-terra sigillata found at Bahrain, Failaka The
DENARII OF TIBERIUS IN SOUTH CENTRAL ASIA
.BEGRAM G BR, AL
IN INDIAN SUBCONTINENT
RC
A
TS
G
GL
B
CA
BR
J
L
AL
SE
IN
ST
ROMAN BRONZE LAMP FOUND IN SOUTH CHINA
JEBEL KENZAN A
BAHRAIN G
SIRAF RC
THAJ A RC
ED-DUR TS RC, G BR
DHAHRAN G
MLEIHA A, G
BIDYA G
SUHAR RC
SAMAD SW
BARAQISH INS
ADULIS A
MARIB TS
MASIRAH A
SHABWA G
TIMNA TS G, BR
KHOR RORI TS A
WADI DURA G
SOCOTRA A, G
QANA TS A, INS
DAMO RP
RAS HAFUN RP
HEIS G
On coastal Egypt, All original artefacts mentioned for India Medi glassware also found by Egyptian mission on Yemen coast. Imitation terra sigillata at Qana and Khor Rori
Also Imitations of Roman coins, amphora terra sigillata, lamps in India
SRI LANKA RC, TS, G
Imitation Roman coins in Sri Lanka
ROMAN LAMP FOUND IN THAILAND
U THONG RC
BAN DON TA PHET GL ?
OC-EO RC SE
KHLONG THOM RC IN G ?
KUALA SELINSING GL
INDIAN
OCEAN

Legends

A = Mediterranean Amphora; RC = Roman Coin; TS = Terra Skgillata; G = Mediterranean Glassware;
GL = Mediterranean Glass; BR = Mediterranean Bronzes; L = Mediterranean Lamps; RP = Roman Pottery (unspecified);
B = Mediterranean Beads; CA = Mediterranean Cameos; IN = Mediterranean Intaglios; j = Mediterranean Jewellery;
AL = Alabaster Objects from Mediterranean; ST = Graeco-Roman statuary (terracotta stone); SW = Roman Sword; INS = Greek Latin inscription

Fig. 2: Distribution of Mediterranean Artefacts across Indian Ocean lands

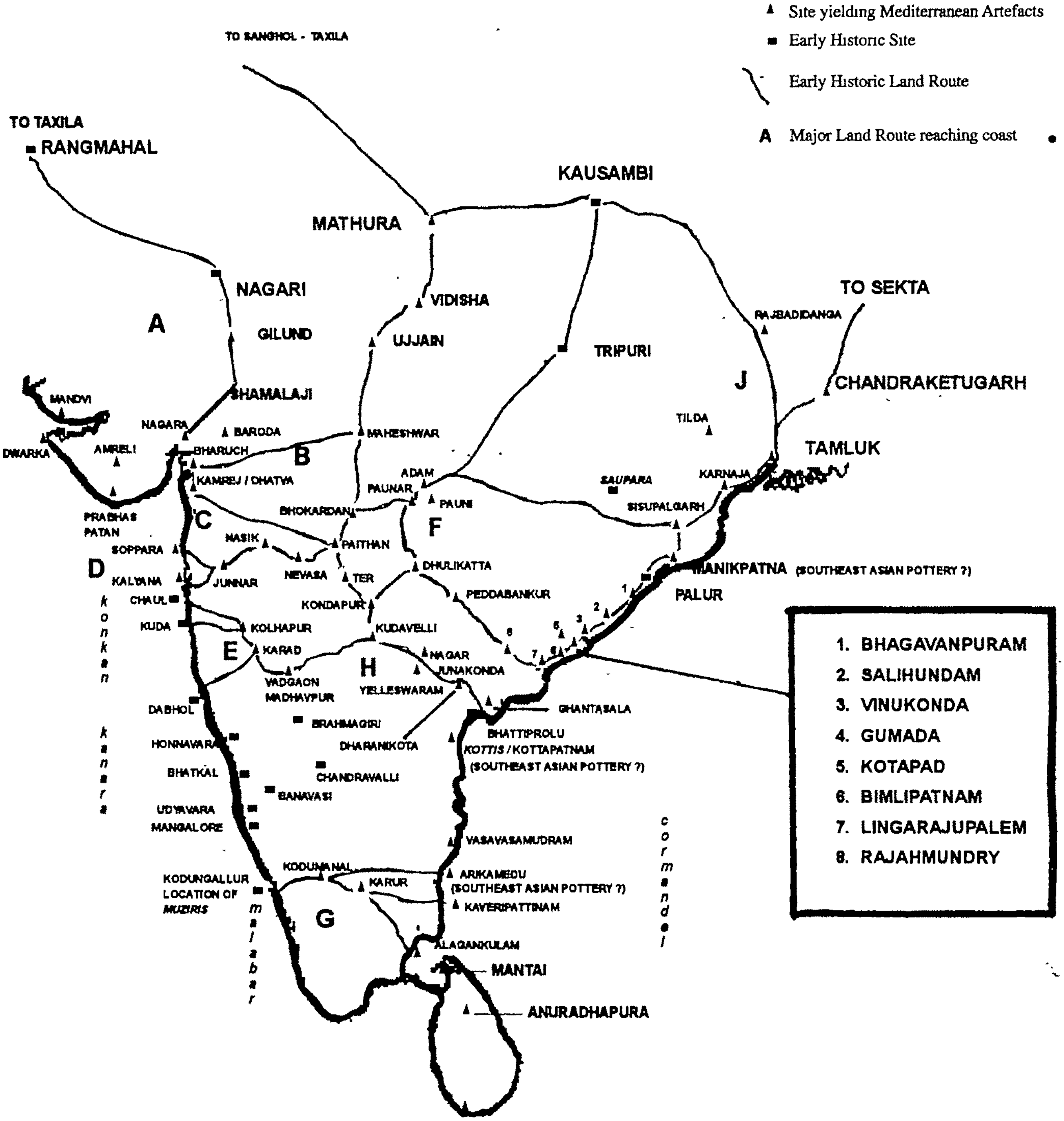


Fig. 3: Distribution of Roman artefacts along trade routes in Early Historic India

shows, Indian trade indicators also proliferate along the Indian Ocean rim, suggesting that Indian trading interests were as much evident across the Indian Ocean as were the Roman (for early Indian shipping see Mookerjee 1912). The idea of a wide Indic network is bolstered with new finds of Indian trade potteries from the Egyptian Red Sea region (Whitcomb and Johnson 1982; Solomon 1991: 731-36; Tomber 2000: 624-31; for the Nabataean/Jordanian Red Sea coast see Gogte 1999: 299-304). In particular, the discovery of an ostrakon at Quseir bearing in Prakrit the names of Indian traders (Salomon 1991: 731-36) and the unearthing of a Dressel 2-4 amphora at Berenike carrying an inscription in Tamil-Brahmi are strong indicators of Indian trading interests in the Red Sea (Begley *et al.* 1996:

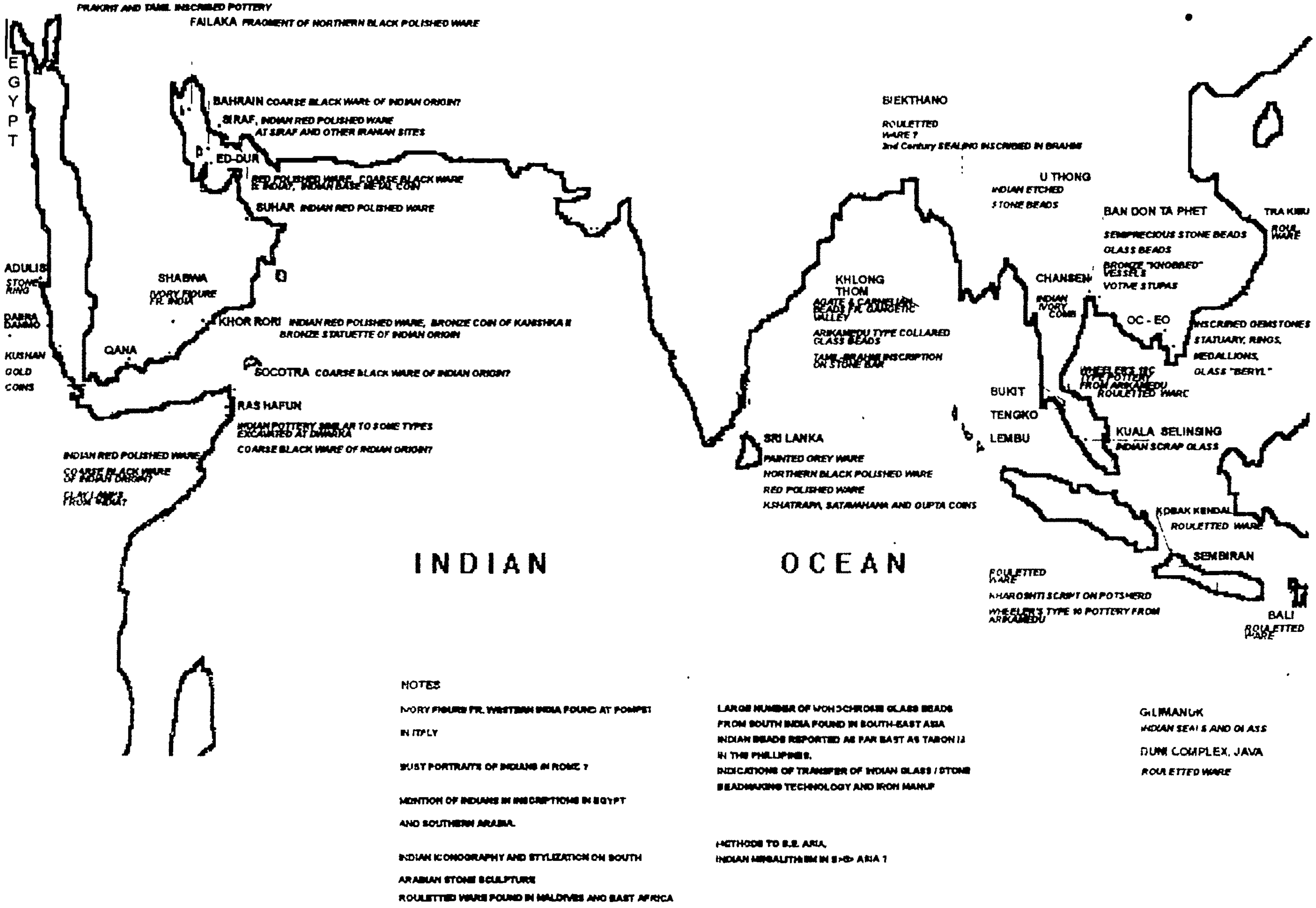

PRAKRIT AND TAMIL INSCRIBED POTTERY
FAILAKA FRAGMENT OF NORTHERN BLACK POLISHED WARE
EGYPT
BAHRAIN COARSE BLACK WARE OF INDIAN ORIGIN?
SIRAF, INDIAN RED POLISHED WARE AT SIRAF AND OTHER IRANIAN SITES
ED-DUR
RED POLISHED WARE, COARSE BLACK WARE & INDIAN BASE METAL COIN
SUHAR INDIAN RED POLISHED WARE
ADULIS
STONE RING
DABRA DAMMO
KUSHAN GOLD COINS
SHABWA
IVORY FIGURE FR. INDIA
QANA
KHOR RORI INDIAN RED POLISHED WARE, BRONZE COIN OF KANISHKA II BRONZE STATUETTE OF INDIAN ORIGIN
SOCOTRA COARSE BLACK WARE OF INDIAN ORIGIN?
RAS HAFUN
INDIAN POTTERY SIMILAR TO SOME TYPES EXCAVATED AT DWARKA
COARSE BLACK WARE OF INDIAN ORIGIN?
INDIAN RED POLISHED WARE
COARSE BLACK WARE OF INDIAN ORIGIN?
CLAY LAMPS FROM GUJARAT
BIEKTHANO
ROULETTED WARE ?
2nd Century SEALING INSCRIBED IN BRAHMI
U THONG
INDIAN ETCHED STONE BEADS
KHLONG THOM
AGATE & CARNELIAN BEADS FR. GANGETIC VALLEY
ARIKAMEDU TYPE COLLARED GLASS BEADS
TAMIL-BRAHMI INSCRIPTION ON STONE SLAB
SRI LANKA
PAINTED GREY WARE
NORTHERN BLACK POLISHED WARE
RED POLISHED WARE
KSHATRAPA, SATAVAHANA AND GUPTA COINS
BAN DON TA PHET
SEMIPRECIOUS STONE BEADS
GLASS BEADS
BRONZE "KNOBBED" VESSELS
VOTIVE STUPAS
TRA KIEU
ROUL. WARE
CHANSEN
INDIAN IVORY COMB
OC - EO
INSCRIBED GEMSTONES
STATUARY, RINGS,
MEDALLIONS,
GLASS "BERYL"
WHEELER'S 11C TYPE POTTERY FROM ARIKAMEDU
ROULETTED WARE
BUKIT TENGKO LEMBU
KUALA SELINSING
INDIAN SCRAP GLASS
KOBAK KENDAL
ROULETTED WARE
SEMBIRAN
ROULETTED WARE
KHAROSHTI SCRIPT ON POTSHERD
WHEELER'S TYPE 10 POTTERY FROM ARIKAMEDU
BALI
ROULETTED WARE
INDIAN OCEAN
NOTES
IVORY FIGURE FR. WESTERN INDIA FOUND AT POMPEII IN ITALY
BUST PORTRAITS OF INDIANS IN ROME ?
MENTION OF INDIANS IN INSCRIPTIONS IN EGYPT AND SOUTHERN ARABIA
INDIAN ICONOGRAPHY AND STYLIZATION ON SOUTH ARABIAN STONE SCULPTURE
ROULETTED WARE FOUND IN MALDIVES AND EAST AFRICA
LARGE NUMBER OF MONOCHROME GLASS BEADS FROM SOUTH INDIA FOUND IN SOUTH-EAST ASIA
INDIAN BEADS REPORTED AS FAR EAST AS TABON II IN THE PHILLIPINES.
INDICATIONS OF TRANSFER OF INDIAN GLASS / STONE BEADMAKING TECHNOLOGY AND IRON MANUF
METHODS TO S.E. ASIA,
INDIAN MEGALITHISM IN S.E. ASIA ?
GILIMANUK
INDIAN SEALS AND GLASS
BUNI COMPLEX, JAVA
ROULETTED WARE

Fig. 4: Distribution of Indian Artefacts across Indian Ocean lands

291). In the early centuries A.D., the deposition of Indian trade artefacts in Southeast Asia is more widespread and marked than in the last centuries B.C.[10]

Similarly, the other littoral-regions were developing their networks. The external contacts of eastern Africa are indicated by deposition of Indian, Persian and Arabian ceramics as much as by Roman potteries (for the African Horn see Chittick 1976: 117-34; 1979: 273-77; Smith and Wright 1990: 106-14; for Swahili coast see Juma 1996: 148-54; Chami 2002: this volume). South Arabia maintained independent contacts with eastern Africa, the Persian Gulf and India even as it benefited from the Roman trade. This is indicated by references in the Periplus (sections 27-32) as well by the deposition of exotic wares at the port-sites of Qana and Moscha/Khor Rori (Yule and Kervran 1993: 69-106; Sedov 1996: 11-35). The Persian Gulf was experiencing a resurgence in maritime activity in the early centuries A.D., with trade ships from India and south Arabia reaching ports near the Hormuz and at the head of the Gulf (section 36 of the Periplus). The port of Suhar was founded in the beginning of the Christian Era near the mouth of the Gulf. Recent excavations at the port-site revealed that 10% of the pottery in the basal level comprised the Indian Red Polished Ware, revealing the harbour's India connections (Kervran 1996: 37-58). The construction of Early Historic lines of trade between western India and the Persian Gulf is being made possible by a growing ceramic and stratigraphic record.[11] Southeast Asian presence along the Indian Ocean littoral is suggested by recent finds of paddle-impressed pottery in eastern India and the Egyptian Red Sea coast (for India see Rao 1995; for Egypt see Tomber 2000: 628-29). Southeast Asian interchange with India not only drew Roman trading interests but also catalysed maritime conduits from the eastern Indian Ocean to the Far East. Thousands of Indo-Pacific type glass beads, manufactured in South-Southeast Asian region, (Francis 1991: 28-43) have been recovered from Yayoi tombs in Japan (3rd century B.C.-3rd century A.D.; Katsuhiko and Gupta 2000: 73-88) and Kaya graves in Korea (1st-2nd century A.D.; Lee 1994: 65-82; also Lee and Wypyski 2002: this volume).

The far deposition of Indian, Arabian, Persian and Southeast Asian artefacts together with Roman trade indicators, signify complex patterns of contact and exchange in the Indian Ocean during B.C.-A.D. transition. Synonymous with the prolific spread of trade artefacts is the foundation or expansion of trade ports and coastal 'market-towns' at more or less the same time (1st century A.D.) along the Indian Ocean rim.[12] The commercial integration of the Indian Ocean in the early centuries A.D. is also reflected the spread of the commodity base (Fig. 5), opening of some of the longest maritime 'highways' of the ancient world (Egypt–India; Egypt–eastern Africa; southern China–India) and rise of syncretic traditions in material cultures, arts and ideologies. These unprecedented developments were integral to what Glover (1990: 10) describes as 'the first appearance of a world system' manifested in 'a vast network of trade stretching from the Mediterranean basin and the Red Sea to South China (and beyond)' (brackets mine).

Conceptual and Methodological Approaches

The Distributional Phenomena

Artefacts, assemblages and sites, and their spatial — stratigraphic distributions, help define the early Indian Ocean world as an interaction sphere, as an arena for long distance contact, exchange and trade. Depositions of 'exotic' materials in 'indigenous' contexts, in particular, are significant for archaeological studies of interchange. The nature of contact to be deduced from transported artefacts (or remains of artefacts) has been always open to scrutiny and debate. I have adopted the positive conception, viewing mute artefacts of foreign origin as relics of 'information flow' (Renfrew 1975: 3-59). Major episodes of early maritime exchanges in the Indian Ocean can be perceived in distributional terms. Enduring contacts gave rise to syncretism in material culture. Regular interaction between the Bronze Age societies of western India and the Persian Gulf caused the appearance of Harappan inspired seals and weights on the island of Bahrain and Mesopotamian-like cylinder seals in the Indus region (Ratnagar 1981). Syncretic materials are also indicators of value. Imitation terracotta cowries found in Han period tombs in Yunnan (southern China) suggest that cowrie shells (imported from the Indian and Pacific Oceans) were highly esteemed (Pirazzoli-t'Serstevens 1990: 45-52). The depth of Indo-Roman trade dynamics is expressed by hybrid artefacts: copies of Roman coins, lamps, amphorae and table wares found in India (Cimino 1994; Gupta 1997). The early Indian Ocean world was (as it remains today) a diverse cultural zone. Goods shipped from production centres to distant consumers must have changed in value as they moved from one milieu to another. For example, red coral from the Mediterranean, having 'aesthetic' value in its provenance area, was prized for its 'auspicious' qualities in ancient India. That objects transited from the cultural to the economic realm is a perspective well articulated in archaeological studies of trade. Considering the issue Renfrew (1984: 83-84) says that 'contemporary archaeology is faced with the problem of "getting inside" early exchange systems in the sense of understanding something of the value systems upon which they are based.' Pursuing this precept, I have plotted exotic artefacts discovered in funerary/religious contexts across the Indian Ocean world in the B.C.-A.D. transition (Table 1). The depositions occur in places imbued with otherworldly significance and therefore can be considered — with due qualifications — as items of high social value. Such datasets could provide

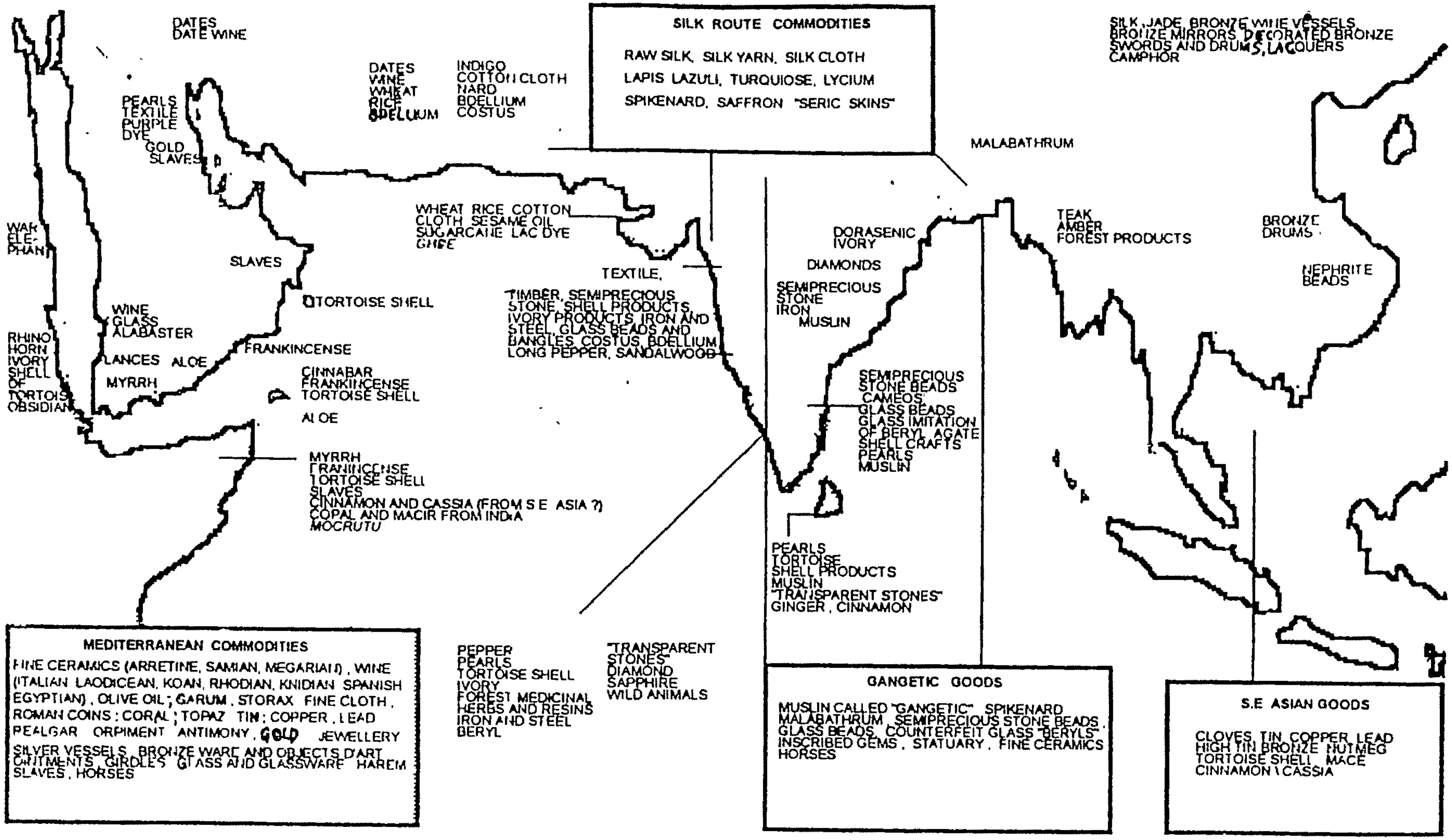


Fig. 5: Commodities traded in the Indian Ocean World in the Early Historic Period

Table 1: Remains of export-commodities recovered from funerary confexts in Indian Ocean lands

Export Commodities	**Funerary Contexts**
Roman Coins	Megalithic burial at Coimbatore (Tamil Nadu). Barrow burial in Nilgiri region (Tamil Nadu).
Roman Glassware	Tumuli field at Baharain (U.A.E.); Tomb at Wadi Dura (Yemen); Jidd Hafs grave group at Baharain; Chamber tombs at Ed-Dur (U.A.E.); Graves at Qallansiya (Socotra).
Mediterranean Amphora	Among grave goods from Mleiha (U.A.E.), Bahrain and Failaka.
Terra Sigillata	Imitation of Eastern *terra sigillata* bowl in burial at Karannah (Bahrain).
Roman Bronzes	Chamber tomb at Ed-Dur (U.A.E.)
Hellenistic 'knobbed' Vessels and Mirrors	Urn burial at Adichallanur (Tamil Nadu); Barrow burial at Nilgiri (Tamil Nadu); Cemetry at Ban Don Ta Phet (Thailand).
Indian Stone Beads/Pendants	Cemetry at Ban Don Ta Phet (Thailand) yielded etched carnelian beads and a crystal lion pendant of Gangetic origin; Number of semiprecious stone beads in grave complexes of Ed-Dur, Bahrain and Failaka may be Indian.
Indian Glass Beads/Pendants	Cemetry at Ban Don Ta Phet (Thailand) has yielded imitation glass 'beryls' and glass beads of Indian origin.
Buddhist Votive Stupas	Buddhist votive stupas of clay have been found among the grave goods at Ban Don Ta Phet (Thailand).

entry points into ancient mindsets. Other lacunae need to be addressed on a conceptual plane. The Indian Ocean in the Iron Age has been largely bypassed by 'mainstream' theoretical formulations on contact, exchange and trade so well applied to understanding the Bronze Age trading systems from western India through Pakistan, Iran, Iraq to the Arabian peninsula (Kohl 1978: 463-491; Tosi 1990; Lamberg-Karlovsky 1975: 341-69; Chakrabarti 1990;Ratnagar 2001: 351-79). For instance, the 'Periplus' entrepots, such as Qana in south Arabia and Bharuch (ancient Barygaza) in western India, can be model 'market places' in Polyani's scheme of long distance trade (Polyani 1975: 133-55). These orientations need to be made part of 'archaeology of trade' narratives in Iron Age of the Indian Ocean. Correlates between archaeology and other disciplines such as linguistics, literature and ethnography also help us understand historical processes in broader terms. I shall briefly discuss major inter-disciplinary correlates with reference to the Indian Ocean in Antiquity.

Archaeology and Tradition

Spread of scripts and languages are synonymous with interchange processes in the early Indian Ocean world. Inscriptions, renderings on seals and coins and papyrus documents come within the pale of archaeological evidence and can be easily legitimised as data. Ancient textual records, on the other hand, need to be *accepted* as historical documents. Some would frown upon the primacy accorded to literary sources in archaeo-historical constructions. An archaeologist once cautioned me against building archaeological analogues for the voyages of King Solomon's ships to the legendary port of Ophir mentioned in Biblical accounts. The archaeologist happens to be an Israeli! The dysfunction between Tradition and Archaeology stems from the 'scientific' view of the latter. Olivier Dickinson in the '*The Aegean Bronze Age*' makes a methodological point: 'Archaeological discovery may throw light upon the legends, but the use of legendary statements for historical interpretation of material records is a reversal of proper procedure'. It is in this sense, I presume, that the primacy of the Bible as a historical document was challenged by my Israeli colleague. However, even an insignificant material indicator may make the whole of a literary corpus interesting to the archaeo-historian, creating inadvertently a powerful context for material evidence. The discovery of a seal from the 8th century B.C. contexts in Israel bearing the inscription 'gold of *Ophir*' is the first material indicator for the existence of Ophir and by implication, for the Biblical references to King Solomon's voyages to this port (Puskas 1988: 15-22). To my mind, no procedure governs the interface between classical sources and material data. This affinity has to be *achieved* in every case. Few would doubt today the respectability accorded to the core texts upon which the history of Indo-Roman sea trade has been constructed. To quote Glover (1996: 131) on this issue: 'Indo-Roman commercial undertakings seem to have been highly organised and are quite well documented in classical writing dating from the 2nd century A.D. even though there is much uncertainty about the details, and revisions are regularly proposed for dating the growth of this trade from the evidence provided by the excavation of archaeological sites which help to amplify the historical sources.' In fact, an eclectic approach to the archaeo-historical idea of the Indian Ocean would persuade us to include — besides the mainstream literary records — oral traditions, folk lore and even legends as potential historical resources. Phillipson, in the *African Archaeology* says that Herodotus' reference to Phoenician mariners circumnavigation of Africa, though 'incapable of proof or disproof' should not be 'dismissed out of hand'. These words apply to the literary records on the early Indian Ocean world.

Archaeology and Language

Archaeolinguistic approaches derive from the axiom that certain assemblages (rice remains with corded pottery in Southeast Asia for instance) represent particular language speaking groups in antiquity. A progressive reduction in dates of these assemblages along a territorial spread indicates expansion and/or migration of the particular language speakers. The model linking the Austric languages, early farming cultures and ethnic communities, has dominated the archaeolinguistics of Southeast Asia (discussion above). Of relevance here is the application of the AA-AN expansion theory beyond Southeast Asia. Let us first focus is upon AA migrations from southern China into eastern India, presumably through Himalayan conduits and possibly also along coastlines. As noted, the evidence for rice cultivation is a primary indicator for the movement of AA and AN language speakers from southern China to Southeast Asia and eastern India. Similarities between agrarian terms in the language of the Munda tribals of eastern India and Mon Khmer speech prevalent in mainland Southeast Asia have been taken to indicate that rice cultivating AA speakers migrated from southern China to eastern India (Higham 1996: 294-95; for discussions on the Yunnan–Assam rice corridor see Watabe 1985: 33-9; Chang 1989: 408-17). Agrawal (2001: 15-22) alludes to extant Mon-Khmer dialects in the Central Himalayas, suggesting that Austro-Asiatic speakers from mainland Southeast Asia migrated westward along the Himalayan foothills, introducing superior iron manufacturing techniques. The problem is that archaeolinguistic correlates for possible AA immigration into Brahmaputra Valley and hilly tracts of northeast India remain undefined. The Mundas, for instance, are far removed from the Indian northeast, having their homeland in the eastern Indian state of Jharkhand.[13] Though handmade cord-marked pottery together with polished celts, diagnostic of early rice cultivating cultures in southern China/ mainland Southeast Asia do occur in northeastern states of India, the few early dates available for the Neolithic levels in northeast India fall between 2000-1500 B.C. These dates are too young for the glotto-chronology of initial AA expansions proposed by linguists.[14]

We also need to investigate the possibility of Southeast Asian neolithism transmitted by sea. Golbai Sasan, a Neolithic–Chalcolitic site on the Orissa coast of eastern India has yielded cord marked hand made pottery with rice husk used as temper in Pd I (Neolithic) basal levels. Polished celts have been found in association. The assemblage is typical of Neolithic cultures of mainland Southeast Asia. The excavator has dated Golbai Pd. I between 2300–2100 B.C. on the basis of a single radiocarbon determination for the beginning of the next phase (Pd. IIa) (Sinha 2000: 322-55; see also Chakrabarti 2000: 240). The situation of Golbai — merely 20 km from the Bay of Bengal — and its unique Neolithic-Chalcolithic assemblage makes us think of possible AA-AN contact along the Bay of Bengal rim. Scholars are now seeing a wider dimension to the Indian Neolithic, probing for its maritime links with early farming communities of Southeast Asia. Sarma (2000) has identified common forms in the Neolithic ceramics of Southeast and South Asia. Weber (1998: 267-274) notes the presence of fox millet of East Asian origin in the Harappan zone. Southworth, in his forthcoming book *Linguistic Archaeology of the South Asian Subcontinent* (quoted in Byrant 2001: 94) has traced the names of seven botanical items in Sanskrit to roots in Austro-Asiatic languages. The foxtail millet (*kanguni*) is one of them, the others being lemon (*nimbu*), betel (*tambuka*), banana (*kadala*), pepper (*marica*), cotton (*karpasa*), sugarcane (*sarkara*). The AA infusions into Sanskrit can be best explained in terms of maritime crossings from Southeast Asia to peninsular India in some undetermined time in antiquity. Survival of archaic AA-AN speeches in the Andaman Sea area, such as Nancowry on the Nicobars, indicate convergence of AA-AN interests in the Bay of Bengal (for archaic AN substratum in the Nancowry see Reid 1988: 31-32; for references to archaic AN languages in Sumatra see Bellwood 1992). I have argued elsewhere that the southeastern littoral of the Bay of Bengal (Andaman Sea region) saw the mingling of high agricultural, metallurgical and maritime skills as Austro-Asiatic and Austronesian expansions reached their limits in this area sometime in the 2nd-1st millennium B.C. (Gupta 2001b). The southeastern corner of the Bay of Bengal is the most likely staging area for early (Neolithic) AA-AN contacts with peninsular India and beyond.

Beyond the Indian subcontinent, Southeast Asian contact with Africa is well attested by the Austronesian speech of inhabitants of Madagascar. The chronology for Austronesian landfall at Madagascar is a matter of debate. Archaeological evidence for early Southeast Asian contact is yet to be discovered in Madagascar or the east African coast, though processes of urbanization are detected in late 1st millennium A.D. (Dewar 1996: 474; Sinclair 1990: 1-40; Radimilahy 1998; Chami 2002: this volume). Certain historical and palaeobotanical indicators point to much earlier crossing of Austronesian seafarers from Southeast Asia to eastern Africa than generally proposed for Madagascar. The African botanical record reveals that three food plants (banana, taro and water yam) were introduced from Southeast Asia at some undetermined date in antiquity. In particular, investigations into the genes of the African banana have revealed several stages of descent from its Southeast Asian ancestor (Blench 1996: 417-436). The introduction of the Southeast Asian banana cultivar into eastern Africa seems to be of great antiquity. Shephard (1982) has proposed that Indonesian sailors were reaching Madagascar and eastern Africa via south India before the Christian Era. Casson (1984: 225-246; 1989: 122-125), reviewing Biblical and Greek records of 1st millennium B.C. asserts that the spices, cinnamon and cassia, were exported to the west from native habitats in Southeast Asia; the best coming from southern China. Earlier, in a seminal study Miller (1969) had argued that cinnamon and cassia were ferried across the Indian Ocean during the B.C./A.D. changeover by Southeast Asian seafarers to the Swahili coast from whence the spices were shipped up the east African coast to the Red Sea region. Recently, Chami has revived Miller's theory (Chami and Msemwa 1997: 673-77; Chami 1999: 205-14). Also, there is much in the Southeast Asian archaeolinguistic context to suggest Austronesian involvement in consigning cinnamon and other botanical commodities from Southeast Asia to eastern Africa sometime in the 1st millennium B.C. Southern Chinese Neolithic communities were amply conditioned for growing and trading botanical products, including cinnamon, by the early 1st millennium B.C. Remains of leaves of the tree *Cinnamomum chingii* have been found at the early rice growing settlement of Hemudu in the lower Yangtze basin dated to 5000 B.C. (Chang 1981:177-186). We find Neolithic trade networks — for jade artefacts — operational across southern China as early as the third millennium B.C. (Huang 1992: 75-83). Austronesian sea traders based in Indonesia were sailing to the far islands of the southern Pacific early in the 1st millennium B.C. (Bellwood 1992). There is no reason why they should not have gone west into the Indian Ocean proper from staging areas close to the Bay of Bengal. Chami (2002: this volume) links the Austronesian 'trader' theory to the Cushitic–Bantu archaeolinguistic debates, proposing that Bantu speakers (identified with Early Iron Working cultures on the Swahili Coast) were middlemen, facilitating transport of Southeast Asian spices from east African entrepots to the Red Sea region. The Austro-Asiatic–Austronesian and Cushitic–Bantu expansion theories, linking Southeast Asia, South Asia and eastern Africa offer strong hypo-deductive contexts for discovering such indicators of trans-oceanic contact.

Ethnoarchaeological Perspectives

The search for history in living entities and practices follows from the premise that present lifestyles reflect ancient modes of living. Isolated tribes, ethnic communities and enduring craft traditions are the staple of ethnoarchaeological studies. The need to construct the role of traditional communities in ancient exchange networks makes the ethnographic record important (Fig. 6). Stiles (1993: 153-67; 1994) has highlighted the role of forest tribes as likely supply of high value botanical products to the Early Historic ports in India. (see also Murthy 1994: 205-18 on the economic relevance of tribes inhabiting the eastern Indian seaboard).The Kadars for instance, a foraging tribe inhabiting the rain forests of the Malabar in south India, are primary suppliers of herbs and resins for making of *Ayurvedic* medicines. A Kadar folklore fragment recollects the arrival of traders seeking forest wealth like dammar and copal in exchange for gold and silver coins. The Malabar and its adjacent hinterland show the greatest concentration of Roman gold and silver coins in the subcontinent. I have tried to show that the Kadars were best positioned to participate in the international trade with the Roman World in the early centuries A.D. (Gupta 2000b: 133-39). The point is that traditional histories of littoral communities and 'origin' legends should not be excluded from a historical discourse on the early Indian Ocean world. The traditional history of the Bene Israeli community of western India informs of a Hebraic diaspora to India not long after the reign of Solomon (Samson 1917; Ezekiel 1981). The Bene Israeli accounts imply that sea routes from the Red Sea to India were open in early first millennium B.C. We are suddenly reminded of the Solomonic voyages. To cite another example, legends in the early chronicles of Japan and Korea speak of the arrival of seafaring communities and their contribution to the genesis of early dynasties. The first volume of the *Kojiki* and *Nihon Shoki*, the oldest Japanese chronicles, speak of the daughter of the Ocean People giving birth to the Emperor Jinmu who established the Kingdom of Yamato at Nara in the 3rd-4th century A.D. The Korean chronicle *Samguk Yusa*, informs that the first queen of the Kaya kingdom in southern Korea (1st–4th century A.D.) came from the 'south' in a ship with red sails. These legends point to early maritime conduits linking the Far East with the eastern Indian Ocean region, a fact archaeologically

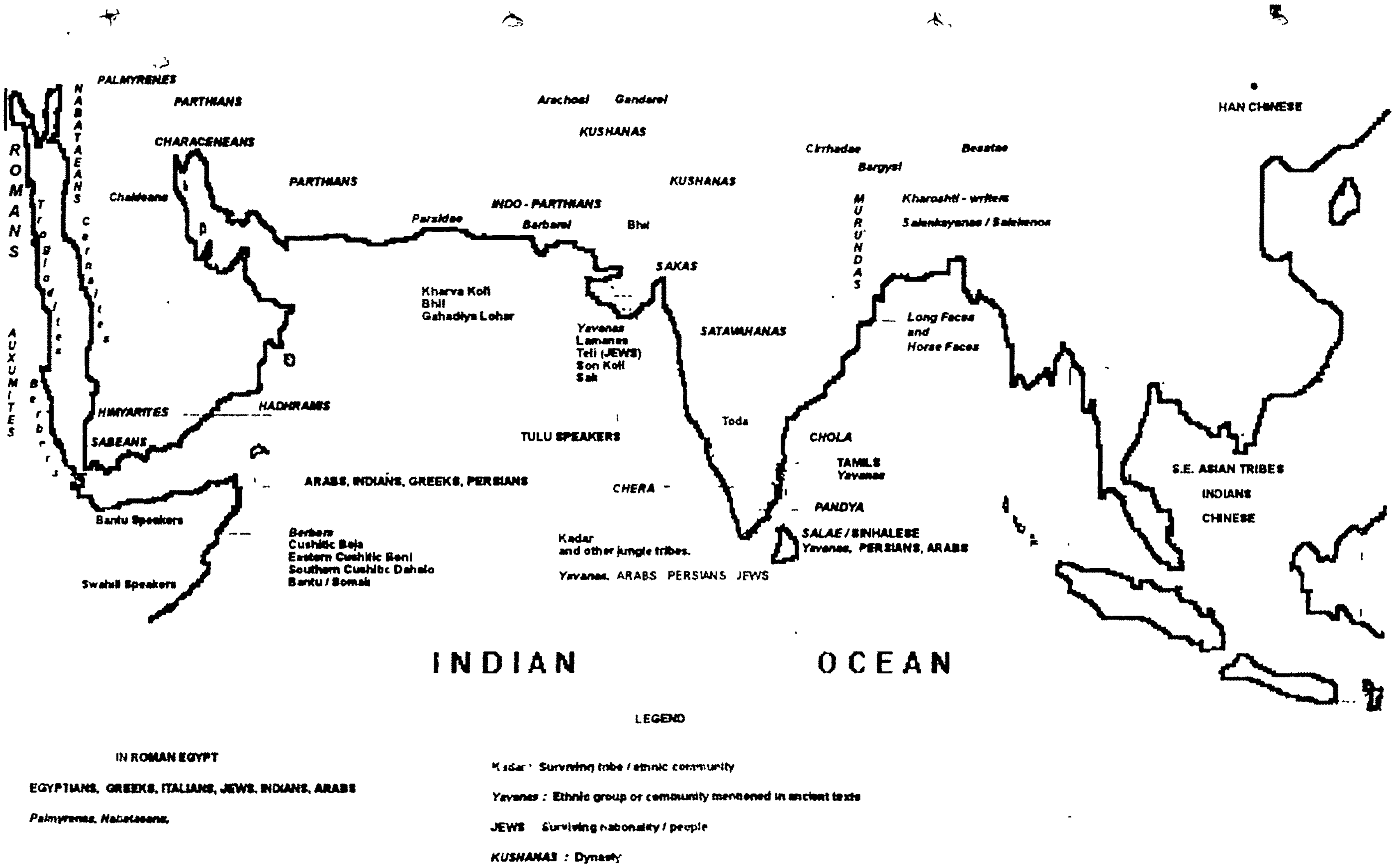


Fig. 6: Communities and dynasties along the Indian Ocean rim

corroborated by the import of large numbers of Indo-Pacific beads into Korea–Japan during the early centuries AD (Katsuhiko and Gupta 2000). The interface between oral traditions, symbolisms and material culture studies has created new approaches, recently applied to understanding littoral settlement processes in Madagascar under the rubric of Cognitive Archaeology (Radimilahy 1998: 1-20).

Ethnoarchaeological studies are also relevant for gaining insights into ancient technologies that dispersed across Indian Ocean lands. Investigations into bead crafting processes in South Asia (for stone beads in India see Kenoyer *et al.* 1994: 281-306; for glass beads see Francis and Basa above) and documentation of traditional watercrafts of the Indian Ocean (for NISTADS Project on Indian watercraft see Ray 1996: 74-85; for Ancient Boats of South Asia Project of the Society for South Asian Studies see McGrail 2001) are some major initiatives in this regard. Ethnographic analogies for the past may possess an element of circularity but as tools of analysis the parallelisms are important for understanding the Indian Ocean Interaction Sphere.

Conclusions

Compared to the monumental entities of Bronze Age Egypt, Mesopotamia and the Indus, the Indian Ocean rim would seem a much less inspiring place. Childe's relegation of the Indian Ocean beyond the 'southern limit' of Old World civilizations is typical of the 'hinterland' view which stresses land to sea outreaches. However, as we have discussed, sea to land dynamics are also evident, as in contribution of 'lower Gulf' cultures to the civilisation of Mesopotamia or the dissemination of Indic culture into Southeast Asia. Adams (1975: 451-64) speaks of the centrality of contact and exchange in the emergence of civilizations. This idea is manifested in the making of the Indian Ocean Interaction Sphere: a great endeavour of humankind to adjust to and control monsoon environments. Adverse marine or coastal environments could not become encumbrances for wide spread exchange activity and establishment of ports from the Red Sea to the South China Sea. For instance, we find two major ports in antiquity, the Harappan harbour at Lothal and the great Early Historic entrepot of Brghukaccha (the Barygaza of Greeks) located on the edge of one of the most violent seas in the world: the Gulf of Khambhat. The sobriquet Monsoon Civilizations can be applied to all urban entities on the Indian Ocean rim which depended on seasonal rains brought by the Trade Winds: Pharaonic Egypt on the Nile floods fed by monsoons over Ethiopia (Hassan 1998), the rich farming cultures of the south Arabian highlands which received the full force of the Southerlies from the African Horn (Edens *et al.* 2000: 854-62*)* and the Indus and Gangetic zones watered by rain and snowmelt of the Indian monsoon (Yasuda and Shinde 2001).

The fact that disparate processes along the Indian Ocean rim were coalescing into tangible techno-cultural traditions, contributing to the rise of sophisticated societies and polities, suggests that the attempt at archaeo-historical construction of the early Indian Ocean is essentially 'civilizational' in its scholastic scope. Following the *longue duree* principle enunciated by Braudel (1973), we can perceive the early Indian Ocean world — if not in completeness of the Childean criteria for 'civilisation' — then surely in terms of 'civilization processes'; an intensifying exchange of ideas, goods and technologies which created a pan-oceanic interaction sphere over a time. Colin Renfrew, in his introduction to *The Encyclopaedia of Ancient Civilizations* points to the significance of such developments which lead to floruits: 'we seek, by comparison and generalization, insight into the more general processes *which underlie* the formation of civilisation. While few definitive conclusions can yet be claimed, there is near unanimity that the task is worthwhile and important...' (Renfrew 1980: 20; italics mine). These observations address the heart of the matter. An archaeo-historical idea of the Indian Ocean can only emerge through the adoption of what Hodder (2001) calls the 'community of discourses model', a pluralistic regimen where syncretism of concepts, methodologies and data become possible. The search for the early Indian Ocean world is therefore a voyage for archaeologists, historians and civilizationists into unfamiliar scholarship, as much uncertain for them as it was for mariners of old taking to the high seas. This paper is part of this quest.

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Endnotes

1 Also studies on protein polymorphism of Indian cattle and African zebu livestocks reveal both to be related, suggesting that animals dispersed along the Arabian Sea rim in ancient times (Manwell and Baker quoted in Grigson 1996: 53). So also the appearance of barley in Oman (early 3rd millennium contexts at Hili 8) morphologically affiliated to east African cultivars (Cleuziou and Tosi 1989: 25, in personal communication with Constantini) Zarins (1992b: 469-483) attempts to make a case for the spread of indigo cultivation along the Indian Ocean rim at some time in antiquity.

2 Italian excavators have proposed earlier dates (early 4th millennium BC) for sorghum seeds recovered from shell middens (the Qumrun complex) on the Batinah coast of Oman (Biagi *et al.* 1989: 1-8) but from what I have read the Italian dates for sorghum in the Omani shell middens have been withdrawn (see Poesshl 1997: 94-95; Edens 2002: this volume).

3 The Austric Expansion theory is modified by evidence of indigenous non-Mongoloid communities who possibly engaged in rice cultivation at the Neolithic settlement of Kok Phanom Di situated at the head of the Gulf of Thailand (Higham and Thosarat 1998: 40-

66). The Austric Expansion theory has its critics but the broad contours of the model are accepted as a basis for investigations into the prehistory of Southeast Asia (see Meacham 1991: 398-407; Bayard 1996. 71-85; Higham and Thosarat 1998: 89).

4 On the Gulf rim. Harappan pottery, etched carnelian beads, seals, ivory comb and Indus 'inspired' material (seals and weights) For review of artefacts see Ratnagar 1981; for finds in Oman and east Arabia see:Newsletter of the Joint Hadd Project 1986-87; Cleuziou and Tosi 1989: 134-161; Cleuziou 1992. 93-103; Shahani 1996. A few artefacts of Gulf provenance have come to light in Harappan sites. In this context we may mention a Persian Gulf seal discovered at Lothal (Rao 1985), a steatite *serie recente* bowl of the Lower Gulf at Mohenjodaro (Cleuziou and Tosi 1989: 41), some Mesopotamian weights at Mohenjodaro (Ratnagar 1981: 186) and some Mesoptamian 'inspired' cylinder seals at Mohenjodaro, Harappa and Kalibangan (Ratnagar 1981: 193-194; Lahiri 1990: 436-437).

5 In the Red Sea region iron manufacturing was taking place in the ancient Nubian kingdom of Meroe around 500 B C. (Shinnie 1996: 320-23). In south Arabia/Gulf of Aden littoral, the Iron Age commences in late 2nd millennium BC and is well established in early 1st millennium BC, reflected in the rise of fortified settlements like Marib (Al Ansary 1996: 243; de Maigret 1984, 1985). In eastern Africa, Chami (2002: this volume) dates Early Iron Working cultures to 4th/3rd century BC. In the Persian Gulf region the rise of the Iranian tribes in the 7th century BC and the coming to power of the Achaemenids is congruent with the Iron Age in the upper Gulf. In the middle-lower Gulf the site of Qalat al Bahrain reveals an iron age sequence in broadly the same period (Potts 1990, Vol. II). In the Indian subcontinent the early Iron Age in northern India is signified by the Painted Grey Ware (PGW) dated from 1200 to 500 B.C. In peninsular India, the Black and Red Ware culture, identified mainly with Megalithic sites, is associated with the Iron Age. The early iron ge site of Hallur is dated to 1000 B C. by radiocarbon (Ghosh 1989). In Southeast Asia the Iron manufacturing is apppears 600-500 B.C. (Bellwood 1992: 129-30).

6 For BDTP finds see Glover 1996; for discussions on a Southeast Asian provenance for stone beads see Smith 1999: 1-26; and Theunissen *et al.* 2000. 84-105; for debate on this issue see Gupta 2001d.

7 For translations of the Periplus see Schoff 1912; Casson 1989; for the Geographia see McCrindle 1884: 313-411

8 To quote Sedov (1992: 125), the excavator of Qana. 'It is most likely that Qana's role as a port of the ancient state of Hadramawt and an important point in international transit trade was directly connected with the establishment and flourishing of the Indo-Roman sea trade at the beginning of the first century A.D. Regular trade between the eastern Mediterranean and the Indian subcontinent probably necessitated the existence of intermediate trading sites on the coast of the Indian Ocean .. This demand helps explain the foundation of Sumhuram, ancient Moscha, the fortress-port on the Dhofar coast which was built at the beginning of the first century A.D. by colonists from Shabwa...'

9 For review of evidence of Early Historic ports in the subcontinent see Gupta 1997; 1994a: 217-225, 1997; for western coast harbours see Gupta 1993: 119-27, 1994c, 1996a: 52-58; Shinde *et al* 2002: this volume.

10 For pottery see Glover 1996:129-158, Gogte 1997. 69-85; Ardika and Bellwood 1991: 221-232; Ardika *et al.* 1993: 101- 109; for beads see Basa *et al.* 1991: 351-65; Francis 1991: 28-43; for early sculptures see Dofflemyer 1999: 38-52; ; Gupta 2001b & d.

11 Salles (1984: 241-270, 1993: 493-523) was the first to identify Indian pottery of Early Historic period in the Gulf sites, including the Indian Red Polished Ware and a new category of storage pottery called the Black Ware which may be either of Arabian or Indian provenance (see also Haerinck *et al.* 1993: 183-193). I was inspired to start a similar program in India and certain Iron Age potteries from the Arabian peninsula and the Gulf region, such as the Black Ware and the green glazed BI Ware have been preliminarily identified in western Indian contexts (reference to Gupta in Salles 1996 note 16; Gupta 1997; Gupta 2001c).

12 Archaeological prospections at the ports and settlements identified with the listings in the Periplus show them to be founded or expanded in the closing years of 1st century BC or 1st century A.D In the Red Sea region, I refer to the major Egyptian ports of Quseir (Periplus' Myos Hormos; Sidebotham 1986; Peacock *et al.* 1999 - 2001) and Berenike (Sidebotham and Wendrich 1995-2000). About the Gulf of Aden, the port of Qana (Periplus' Kane Emporium; Sedov 1992; 1996) and Khor Rori (Periplus' Moscha Limen; Yule and Kervran 1993) At the mouth of the Persian Gulf, the port-site of Suhar (Kervran 1996) and Ed-Dur (Periplus' Omana; Potts 1990). In the Indian subcontinent, the field data on ports listed in the Periplus show that most flourished in the early centuries A.D. (Gupta 1997 for review) In Southeast Asia, the coastal settlements of Takua Pa ?(Malaysia), Sembiran (Ardika and Bellwood Indonesia) and Oc-Eo (Vietnam) reveal prolific evidence of Indian (and Roman) contact in the early centuries A D.. The link between greater deposition of exotic artefacts and foundation/expansion of trading settlements across the Indian Ocean is too conspicuous to ignore.

13 Quoting from the latest report of the Anthropological Survey of India: 'Their present day homeland comprises of the Chotanagpur Plateau, Ranchi District and Khunli subdivision when they migrated from further east and got concentrated'. The report further informs that Munda populations in Assam and Tripura came as contract labour from their Jharkhand homeland. Singh (1998: 2390).

14 'The entire northeastern region has yielded a rich haul of polished Neolithic tools but no consolidated picture of a Neolithic level has yet emerged... The only early date of handmade cord-marked ware in the entire northeast is a thermoluminecsent date of 1650 ± 350 BC from the site of Napchuk located in a hiiltop of Manipur' (Chakrabarti 2001. 240-41) A carbon 14 determination from Tripura records 3450 ± 110 BP for Neolithic sequence in that area (Ramesh 1989). For review of Neolithic of northeast India see TC Sharma in Encyclopaedia of Indian Archaeology, Part I. Delhi: ICHR. For preliminary reports of northeast Indian Neolithic see also the following volumes of *Indian Archaeology — a Review:* Garo Hills 1965-66: 6, Garo Hills 1969-70: 1-2; Ambari, Assam 1970-71: 4-5, Garo Hills 1974-75: 36; Nagaland 1980-81: 44. The AA-AN expansion theories have been little discussed by Indian archaeologists searching for the origin of rice cultivation in India The focus is upon 'indigenous epicenters' such as at Koldihawa (Middle Ganga Valley), Kunjhun (Vindhyan Hills) and Kuchai (interior Orissa) (Misra 1999: 233-66; Chakrabarti 2001). These dates do not reconcile with the glottochronology of 4000 B.C. proposed for AA penetration (see Higham on Blust: 1996: 294) At the moment we need to de-link the proposed glottochronology and view the indicators of Southeast Asian neolithism in eastern India purely in archaeological terms.

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Indian Fine Wares from the Red Sea Coast of Egypt

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Abstract

This paper presents new evidence for Indo-Roman sea trade during the early Roman period and focuses on the Indian fine wares found at the two most important Egyptian Red Sea ports during this period, Berenike and Myos Hormos. The forms and clay fabrics of the vessels found in Egypt are summarised and comparisons drawn with India, particularly from the site of Arikamedu. Two main forms occur in Egypt, and these belong to the well-known 'rouletted' ware (Wheeler *et al.* 1946: Type 1; Begley 1996a: Form 1) and stamped bowls (Wheeler *et al.* 1946: Type 10; Begley 1996a: Form 5).

Introduction

Egypt was vital to trade between India and the Roman world, with its Red Sea ports acting as a funnel for goods from the Indian Ocean to the Mediterranean world via Coptos on the Nile and ultimately Alexandria (Fig. 1). The two Egyptian Red Sea ports for which the most evidence exists, and which were seemingly the most important during the period in question here, the early Roman period, are Berenike and Myos Hormos. Both of these sites have produced tangible evidence of this long-distance trade through a range of environmental and cultural artefacts (Sidebotham and Wendrich 1996, 1998, 1999, 2001; Peacock *et al.* 2000, 2001), including both coarse wares and fine wares. The emphasis here is on fine ware from India found in Egypt. Much of the evidence presented here has been published in more detail in disparate sources (Begley and Tomber 1999; Tomber and Begley 2001; Tomber 2001a, 2001b), and the purpose here is to summarise this new evidence and to bring these findings to attention of scholars working outside Egypt.

Background

The historical context of Egypt and its role within Indian Ocean trade is well known, particularly through the *Periplus Maris Erythraei* or Sailing Guide to the Erythraean Sea, which encompasses — in ancient terms — the Red Sea, Gulf of Aden and the western Indian Ocean. Dating to the mid-first century A.D., this document is a first hand description, probably from an Egyptian merchant or sailor, of the various ports and the goods exported and imported between them (Casson 1989). A second group of documents also dates to the first half of the first century A.D. (*O Tait* P220-304/Tait 1930-64; Fuks 1951). This archive, from the Nicanor family shipping business, comprises receipts for an export trade operating out of Coptos and between the ports of Berenike and Myos Hormos during the period 6 B.C.-A.D. 68/69, confirming shared suppliers, from at least one merchant family, for the two ports. Both documents emphasise the role of Coptos as a transhipment point between the Red Sea and Alexandria. Six Egyptian Red Sea ports (Sidebotham 1991: 15-20) are known from the *Periplus*, with Berenike and Myos Hormos the ones which served as starting points for ships to India at the time of writing (Casson 1991: 8).

Berenike, or Berenice of the *Periplus* is the more southerly of the two ports. Here excavation has been conducted by the Universities of Delaware and Leiden since 1994 (Sidebotham and Wendrich 1995, 1996, 1998, 1999, 2001). According to the ancient texts the site was active between the mid-third century B.C. into the early sixth century A.D. and this is supported by the archaeological evidence; rubbish deposits of the late Augustan period and mid-first, into the third quarter of the first century A.D. are prolific (see also Bagnall *et al.* 2000: 7).

Approximately 300 kilometres to the north is the modern site of Quseir al-Qadim, equated with the ancient port of Myos Hormos on both topographical (Peacock 1993) and epigraphic grounds. One papyrus recovered from excavations at Myos Hormos in 2000 is particularly compelling; part of a loan, it refers to 'In Myos Hormos on

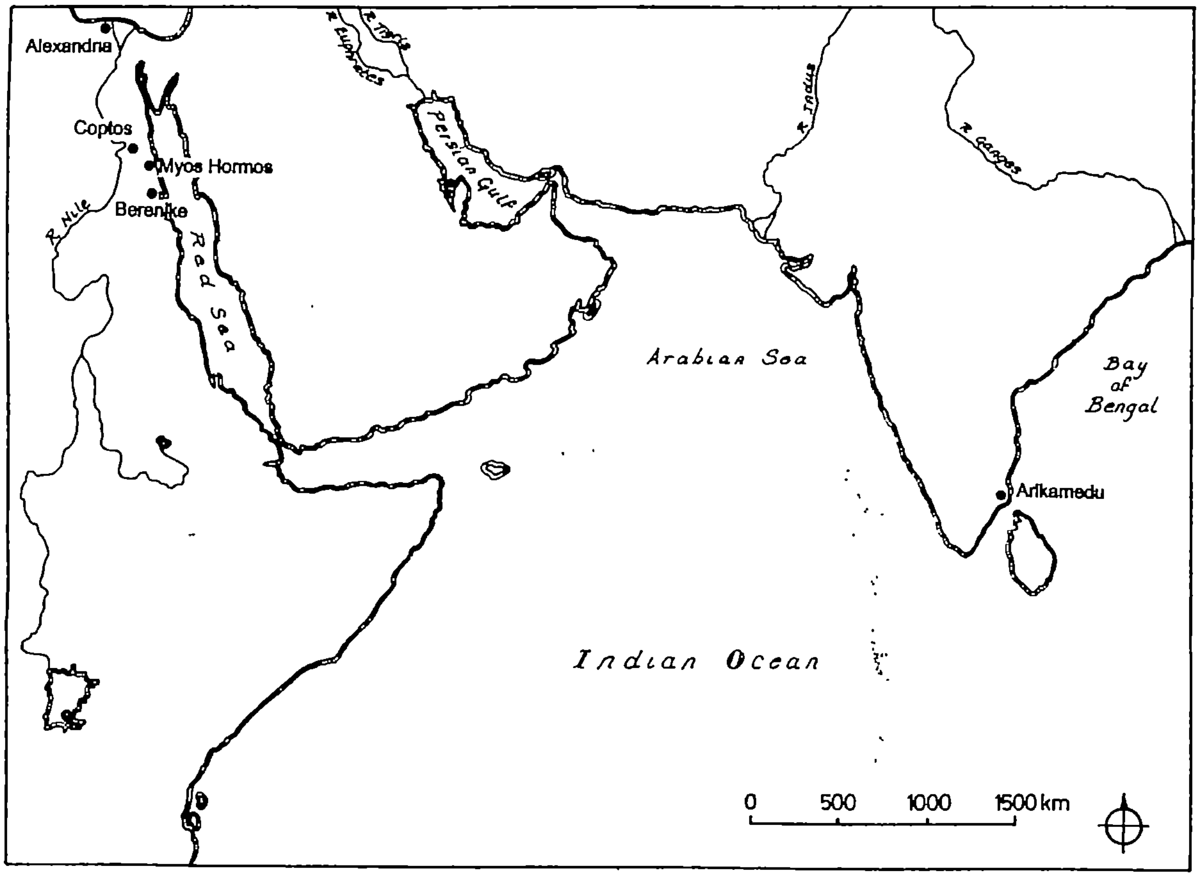

Fig. 1: Location map of main sites mentioned in text

the Red Sea...' (van Rengen 2000: 51). Three excavation seasons by the University of Chicago, in 1978, 1980 and 1982, identified an early Roman and Mamluk sequence (Whitcomb and Johnson 1979, 1982). The early Roman pottery was dated from the late first century B.C. through the third century A.D. (Whitcomb and Johnson 1979: 67), with a coin of Ptolemy III (247-22 B.C.) interpreted as a residual or curated find from the early Roman period (Sidebotham 1991: 36, footnote 44). Since 1999 a major excavation campaign at the site by the University of Southampton has uncovered extensive early Roman deposits of similar date, from the late Augustan period into the third century (Peacock *et al.* 1999, 2000, 2001). Although no pre-Augustan levels have as yet been identified, evidence for this is growing with both ceramics and coins of Ptolemaic date recovered, particularly from Augustan layers.

Access between Berenike and Myos Hormos and the Nile (Fig. 2) is facilitated by several road systems. One, the Via Hadriana (Sidebotham and Zitterkopt 1997, 1998; Sidebotham *et al.* 2000), runs east from the Nile at Antinoopolis and then parallel to the coast where it

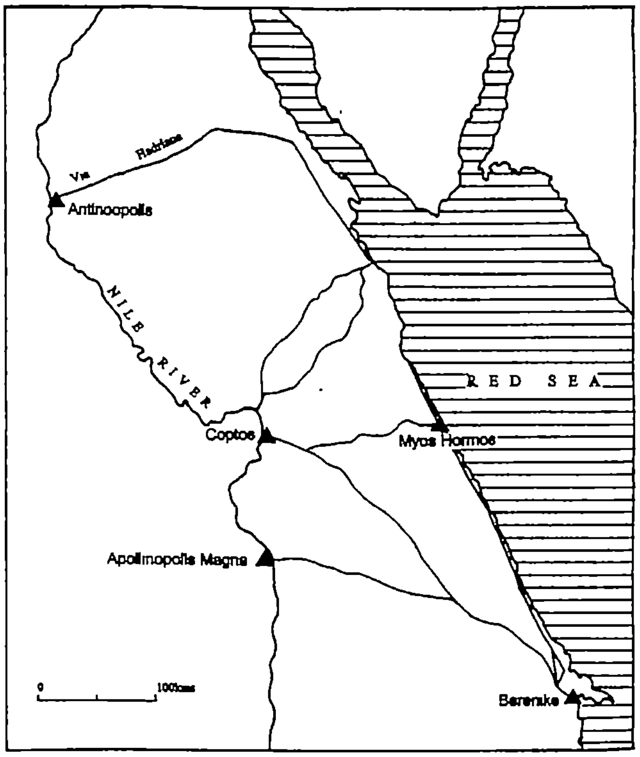

Fig. 2: Map showing the main road systems between the Nile and the Red Sea

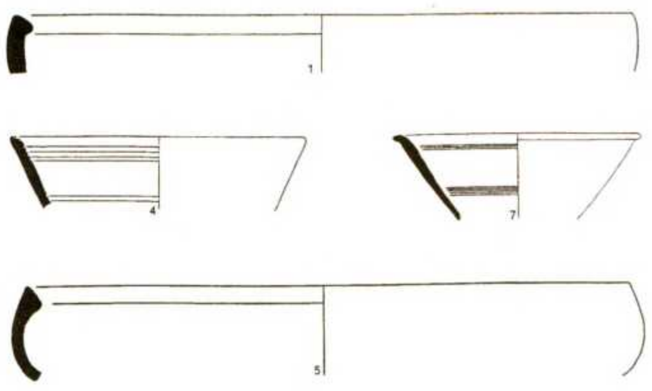

Fig. 3: Indian fine wares from Berenike and Myos Hormos (1:2)

terminates at Berenike. More important in terms of Red Sea trade is a southerly east-west network originating at Coptos and splitting to the east and south 30 kilometres from the Nile: the easterly branch terminates at Myos Hormos (Bülow-Jacobsen 1998: 65; Zitterkopt and Sidebotham 1989), while the southerly one eventually joins up with another originating at Apollinopolis Magna before terminating at Berenike. Both roads from Coptos are punctuated by installations, some of which have recently been excavated (Bülow-Jacobsen 1998).

Indian pottery from Egypt (Figs. 3-6)

Excavations at Berenike and Myos Hormos have brought to light a range of pottery from outside the Roman Empire. At both sites this includes coarse ware forms (cooking

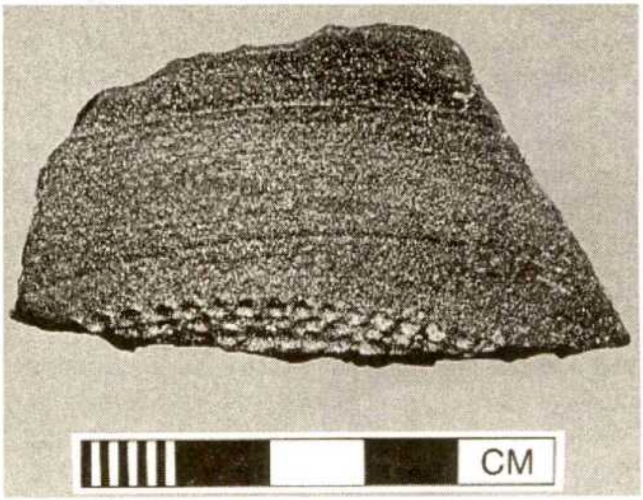

Fig. 5: Rouletted ware from Berenike

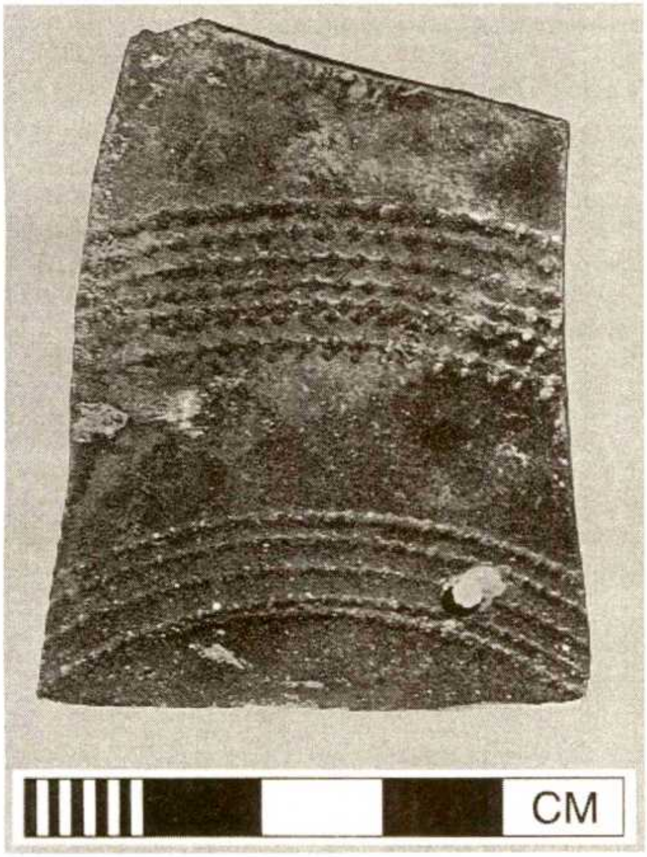

Fig. 4: Rouletted ware sherds from Berenike

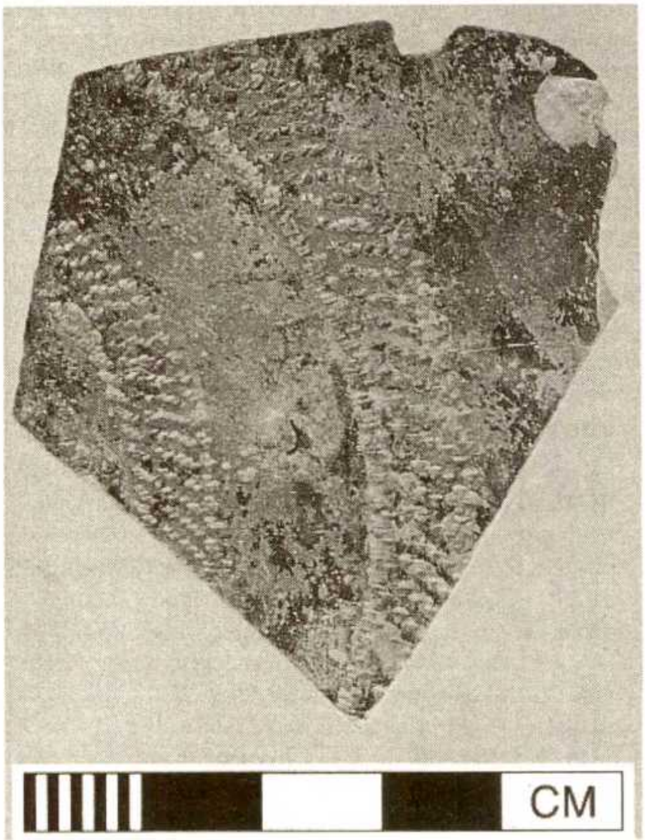

Fig. 6: Rouletted ware from Myos Hormos

pots, casseroles and lamps/lids) common throughout India and elsewhere in South Asia. Although an Indian source is likely for these utilitarian vessels, no exact fabric parallels have as yet been identified within India for the sherds found in Egypt (Begley and Tomber 1999; Tomber and Begley 2001; Tomber 2000a, Tomber 2000b). However, in addition to these utilitarian vessels, a much smaller number of distinctive fine wares with a more secure Indian provenance have also been recovered from Berenike and Myos Hormos. Although some closed vessels are present, typically they are one of two open forms: a dish and a cup or small bowl, both of which are classic types identified by Wheeler (*et al.* 1946) and Begley (1996b) at Arikamedu on the Cormandel coast. In Egypt most, but not all vessels, conform to Fineware 1 (FW 1) found at Arikamedu (Begley 1996b: 121-2), which is generally a pale to medium grey clay, inclusionless apart from common silver mica and occasional impurities, with black, frequently glossy, slip; both vessels types but particularly the dish may be two-tone in colour. Although still a matter of debate, Gogte (1997) has proposed the Ganges delta as the production area for these vessels.

The dish (Wheeler *et al.* 1946: Type 1; Begley 1996b: Form 1) has an in-turned, beaked rim and flat base decorated with bands of 'chattered' decoration, from which it derives its common appellation of 'rouletted' ware. The small stamped bowl or cup (Wheeler *et al.* 1946: Type 10; Begley 1996b: Form 5) has a plain rim with splayed walls and flat base and is characterised by two bands of parallel incised lines on the inside wall and another group at the juncture of the base and wall; typically, although not always, animal stamps occur between the bands on the wall. At Arikamedu, which provides the most extensively published and dated examples of FW 1, it is known from the first century B.C. to about the third century A.D. (Begley and Tomber 1999: 168); much earlier examples, dated to ca. B.C. 350-275, have been cited from Anuradhapura in Sri Lanka (Coningham and Allchin 1995: 167).

Egyptian Fine Ware from Berenike

At Berenike the majority, but not all, of sherds fall into FW 1. Estimation of the number of vessels present has been undertaken on material recovered through the 1998 season, and while there were additional sherds from 1999-2001 they are not as substantial in number as in previous seasons. At present there are a minimum of six vessels of dish Type 1, two of which occur in a coarse, sandy fabric similar to Arikamedu Coarse ware 1A (CW 1A, no. 3); the remainder are in the usual fine ware fabric. The small bowl or cup, Type 10, is slightly less common, represented by a minimum of four vessels. Three of these are in the standard FW 1 fabric, the fourth in an allied but poorer quality one. The majority of these sherds come from large rubbish dumps.

1. Wheeler Type 1 rim. FW 1. Burnt, resulting in a grey-brown (10R 5/6) internal margin, bleeding to black; the external margin is orange-brown (2.5YR 4/4). Even, lustrous slip all over, although the sherd is pitted both internally and externally. The external surface is brown-red (10R 5/6-4/6); the internal, black (2.5/0). BE97-13.002 [5258-G]. Locus date: mid/late first century.

2. Wheeler Type 1 base with two bands of chattered decoration and secondary piercing. FW 1. Medium grey (5/0) with black slipped surfaces, both of which are burnt. BE97-5.152 [5174-G]. Locus date: late Augustan.

3. Wheeler Type 1 base with three extant rows of chattered decoration. enclosed by two shallowly grooved concentric circles, likely to have been intended for orientating the placement of the band of decoration but not utilised because of their asymmetrical alignment. Fabric similar to CW 1A. Fine clay matrix with silt-sized quartz and probably some mica and/or black ferromagnesian minerals. Black throughout with glossy, slipped surfaces. BE98-12. Baulk trim [4566-G]. Locus date: undated.

4. Wheeler Type 10 rim. FW 1. Medium grey (5/0) with a dull even grey (4/0) slip on the interior; the exterior is mottled brown-grey (2.5YR 5/1-5/2) to red (10R 5/6). BE 96-7. Baulk Trim [5172-G]. Locus date: undated.

Another Wheeler Type 10 has a slight impression between sets of grooved lines, suggesting that an attempt may have been made to stamp it.

Egyptian Fine Ware from Myos Hormos

At Myos Hormos all the vessels fall into Arikamedu FW 1. The fewer number of sherds, relative to Berenike, mean that the number of vessels can be confidently estimated. Type 1 is represented by a total of 16 sherds, representing two or, more likely, three vessels; Type 10 comprises three sherds, probably two vessels. All the fine ware sherds were recovered from the same deposit, associated with the harbour, and are likely to have been deposited during the late Augustan period.

5. Wheeler Type 1. FW 1. Dark grey (4/N) with glossy black slip on the interior, the rim top and the exterior, apart from a band of orange (2.5YR 6/8) colouration in the middle of the outside wall. QaQ 2001 [10017]. Locus date: late Augustan.

6. Wheeler Type 1 base with two bands of chattered decoration. FW 1. Fabric coloured as no. 5; originally covered on both sides with glossy black slip, now abraded in part. QaQ 20001 [10012]. Locus date: late Augustan.

7. Wheeler Type 10. FW 1. Pale grey (5/N). Much of the internal slip is abraded, but where adhering it is glossy and black; the external surface has good quality glossy orange (2.5YR 6/8) slip, mottled to red (7.5R 4/6) on the

lower wall; there are vestiges of black slip on the rim lip. QaQ 2001 [10011]. Locus date: late Augustan.

Discussion

The same forms of Indian fine wares are present at both Berenike and Myos Hormos; although they are somewhat more common at Berenike this is probably due to the more extensive excavations undertaken there. It is notable, however, that at both sites the Wheeler Type 10 bowls occurs in the less common unstamped version, which indicates a shared source or even a shared and possibly single consignment.

The only other sherds of Indian fine wares thus far identified from elsewhere in Egypt consist of three sherds from Coptos (Elaigne 1999; Reinach 1912). The distribution of fine ware sherds is therefore explicitly associated with sites strategic for Indo-Roman trade and traders. In South Asia the distribution of rouletted ware, in tandem with much smaller quantities of Wheeler 10, is biased although not restricted to the eastern coast of India and the western coast of Sri Lanka (see Begley 1996a: fig. 1.12; Ray 1998: fig. 6; Silva 1985), although growing numbers from further inland at Anuradhapura in Sri Lanka are known (Coningham and Allchin 1995) and small numbers from Southeast Asia (Ardika and Bellwood 1991). In 1999 the evidence from Berenike suggested that these vessels represented personnel possessions of Indian traders, who may have originated from Arikamedu (Begley and Tomber 1999). The growing numbers of the paddle-impressed utilitarian pottery associated with eastern India (Tomber and Begley 2001) found at Berenike and Myos Hormos supports contacts with the east, while new archaeobotanical evidence of black pepper from Berenike (Cappers 1998) and Myos Hormos (Van der Veen 2000: 59) demonstrates the importance of products from the Malabar coast. As the volume of Indian artefacts and environmental finds from the Red Sea increases, so will our understanding of the sources of these goods and the trade mechanisms involved.

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People and Contacts in the Ancient Western Indian Ocean Seaboard or Azania

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Abstract

This work presents archaeological data that sheds light on the people of the ancient Western Indian Ocean Seaboard (WIOS) and their contacts with the rest of the world, especially the Indian Ocean seaboards. Data for the period ranging from the beginning of the last millennium B.C. to about A.D. 500 is examined. This paper has utilized previously ignored historical data for the period before the Christian era. Recently, archaeological work conducted on the coast and islands of Tanzania has thrown more light on the question of the ancient peoples and cultures of the WIOS and their contacts with the rest of the ancient world. Old archaeological data from the interior has also been used to provide more support to the new thinking. The WIOS had people who practiced Neolithic tradition before 200 B.C. Sites of this period include the Ukunju cave in Zanzibar where trade goods and other items such as chicken bones suggest contact with the rest of the Indian Ocean seaboards. The people of the Early Iron Working Tradition took over after A.D. 200. The Rufiji sites of this period have yielded trade goods including beads from the Mediterranean world.

Introduction

The WIOS comprises, from north to south, the coast and the interior of the modern day countries of Somalia, Kenya, Tanzania and Mozambique. Also included are the islands of Zanzibar, Commores and Madagascar. This eastern part of Africa was the one known by the Greco-Romans as Azania (for conspectus see Casson 1989: 136-142). It seems that from about the 6th century A.D. the name of the region was changed from Azania to Zanj/Zinj. The latter continued in use upto the 13th century A.D. (Tolmacheva 1986; Trimingham 1964). In the 14th century A.D., Ibn Battuta (Gibb 1939: 112) identified the stretch from southern Somalia southwards as 'Sawahil' or 'Swahili country'. This name was kept in use up to the beginning of the colonial times, till about 1884-85 when the modern African territories were born under the Berlin Conference. The conference brought together the European powers and partitioned Africa into their colonial territories (see Penson 1952).

Azania was the name given to the modern Indian Ocean by the earliest known East Africans, probably Bantu speakers. Hence the ancient East African territory and its people were identified with the ocean and hence 'the people of Azania' (Chami 1996). Indeed the same applies to the Indian subcontinent and its people as they are identified with the Indian Ocean. In the word Azania, '*za*' meant, 'mass of water', i.e. lakes, and the addition of '*ni*' meant 'large mass of water' i.e. ocean. It has been observed that most lakes in the Bantu speaking region have kept the remnant word '*za/zi/sa/si*', i.e. Nyan*za* for Lake Victoria, Nya*sa* for Lake Malawi, and other lakes like *Za*kwati, Man*zi* and Eya*si* (see Chami 1996). Some Bantu-speaking groups, i.e. Chaga of Kilimanjaro, still have a remnant '*ni*' in their words that suggest 'large', i.e. '*ingani*' or '*nini*'.

The successor word to Azania, zanj or zinj, came to connote the same meaning as that of Azania although scholars have always wrongly associated it with blackness and slavery (for various views see Tolmacheva 1986). Zanj meant 'the country' or '*nji/nchi*' of the 'ancient Indian Ocean' then called '*za/zi*'. Joining these brings 'zanji' or 'zanchi'. In fact, most modern Bantu speakers, including the Swahili of the coast of East Africa, still use 'nchi' or 'nji' for a 'country/territory' or 'settlement'.

Indeed, when the Zanjian people adopted Islam, more so in about the 13th century A.D., they started using Arabic as a learned language of the elite. It is at this time they replaced Zanj with '*sahel*' (pl. *Sawahil*, adj. *Sawahli* or *Sawahili*)(see Chami 1998: 214) an Arabic word with the same meaning, 'coast'. Today, as it has been from the medieval time of the Swahili city-states, Swahili is the *lingua franca* of the WIOS.

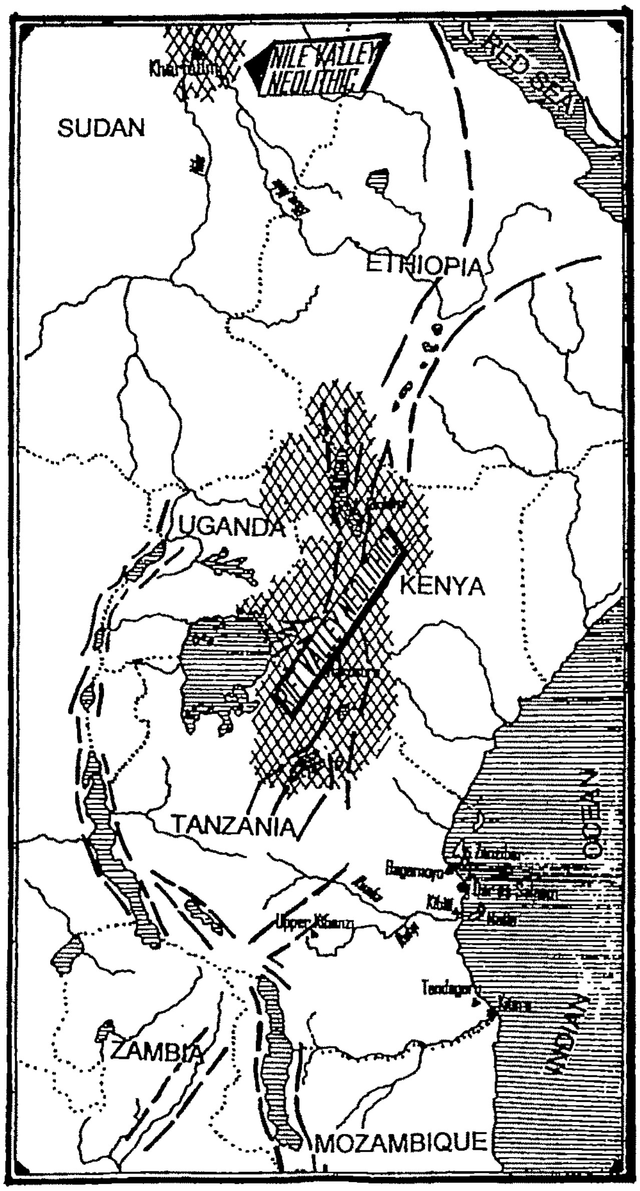

Fig. 1: A map of eastern Africa showing the area with Neolithic/ PN sites in the Rift Valley and the Nile Valley (cross-hatched area) and the remaining Tanzanian sites

Stockley (1928), Morgan (1973) and Chami (1994) have discussed the geo-environment of the WIOS. This region can be divided into two main environmental zones: the drier environment north of the Kenyan coast and the tropical/equatorial south identified elsewhere as Zanzibar-Inhambane Regional Mosaic and its wooded and savannah interior (White 1983). The existence of monsoon/trade winds made the coast of East Africa accessible from the Red Sea/Middle East and India since the ancient times (for conspectus see Casson 1984; McClanahan 1996).

It should also be noted that the WIOS has been settled by agriculturists probably earlier than 1000 B.C. Political and trade centres have developed since then, enabling organized production for both subsistence and long-distance trade extending to the rest of the Indian Ocean and beyond to the Mediterranean world. This work focuses on the ancient period with dates ranging from 1000 B.C. to about A.D. 500.

Issues at Stake

This is not for the first time that the problem of peopling on the WIOS and the trade links that existed in the past has been addressed. The more relevant publications are those that emerged after 1960s to about 1990. The literature includes those of Chittick (1965, 1975, 1977), Sheriff (1981), Casson (1989), Horton (1990), and Sutton (1990).

The dominant notion then was that Cushitic speakers had settled the WIOS in ancient times. These are people with origins in the Rift Valley and the Horn of Africa (see Casson 1989: 136), occasionally viewed as Caucasians (see Phillipson 1993: 157) and also viewed as practicing a pastoral mode of production (Bower and Nelson 1978; Robertshaw 1990). However, specialists of the ancient Rift Valley culture have not supported the speculations that the Neolithic and Pastoral traditions spread to the coast of East Africa. They have put the limit of the south and eastward spread to the Serengeti and Kilimanjaro parts of Tanzania respectively (Bower and Nelson 1978; Robertshaw 1990).

Scholars who have insisted on the presence of Cushites/Pastoral Neolithic (PN) on the coast of East Africa in ancient time include Sutton (1994-95: 230, see his changed opinion in 1998), Horton (1990, 1996) and Abungu (1994-5). In a recent publication Ehret (1998) has argued that Nilo-Cushitic speakers established the ancient civilization in the general region of eastern Africa, including the coast, as far south as Zimbabwe where a Neolithic tradition called Bambata is now attested to have occurred before the alleged arrival of the Bantu speakers. The latter became mere cultural and technology borrowers and people of constant immigration.

This notion has strongly been challenged by the use of archaeological and old historical data. As shown below, it has now been established that Negroid people, 'tillers of soil', probably Bantu speakers, had been on the coast and the Rift Valley from the Neolithic period (Gramly and Rightmire 1973; Gramly 1978; Casson 1980; Chami 1999a). Sites of such people, those of Neolithic and Early Iron Working (EIW) farmers are now found on the littoral and islands of the WIOS.

Another problem pertains to the arrival of Austronesians to East Africa. These are conceived to have arrived via a northern Indian Ocean route in about the 3rd century A.D. (Ehret 1998: 277-279). They are alleged to have brought Asiatic technologies and domesticates including banana, coconut, taro and sugarcane (Simmonds 1962: 143-149; Oliver 1966; Jones 1971; Ehret 1998: 277-279). It is thought that the Bantu speakers, who are supposed to have settled in the interior near the coast in the same time period, borrowed these inventions from the new arrivals and then spread them all over the African subcontinent (Ehret 1998: 278). After intermarriages with the Bantu speakers the Austronesians are then said to have moved to the south to settle on the island of Madagascar where their alleged offspring are now found.

A strange development in this Austronesian problem is that several scholars publishing between 1980 to the present argue that all Asiatic related technologies, art and domesticates arrived on the coast of East Africa only after A.D. 800 (Macdonald 1993: 589; Epistein 1971: 514; Wigboldus 1994-5: 123). This date is viewed to have coincided with the growth of the Indian Ocean Sea trade after the establishment of Islamic communities.

The problem pertaining to the arrival of Bantu speakers and the Austronesians has recently been addressed by Chami (2001a, b). The problem of the Austronesians' arrival to the WIOS in ancient times should be left for future research due to two reasons.

First, there is no archaeological site, up to now, that has been found in Madagascar dating to before the 8th century A.D. Second, there is no cultural material that has been found on the coast of East Africa directly related to the Austronesian occupation.

Neolithic: 1000-200 B.C.

Neolithic culture emerged in eastern Africa from 5000 B.C. and continued with changes of traditions up to about the last centuries B.C. when iron technology was adopted (Phillipson 1993). It is, however, debatable whether the microlithic, pre-iron technology traditions should be called Neolithic or Pastoral Neolithic or just Later Stone Age (LSA) (see Phillipson 1993: 153; Sinclair *et al.*, 1993: 3-8). Since domestication and pottery making in the LSA have been taken to be the main criteria for a tradition to be called Neolithic, I have used this concept Neolithic with that meaning.

Cultural Evidence

It was shown in the problem section that scholars studying the Rift Valley Neolithic traditions have not accepted the idea that the Neolithic culture ever appeared on the coast of East Africa. Those who have propagated the idea have thought that the coastal Neolithic tradition would have been of pastoral mode of production or PN. The latter speculated about a coastal Neolithic not because they had found sites of Neolithic on the coast and islands, but just because Periplus had reported people involved in the transoceanic trade. In the 'Hamitic Myth' paradigm (Sanders 1969), scholars conceived people participating in an international trade to be not of Negroid, Bantu speaking, character, but of Cushitic origin (Horton 1990: 96; Ehret 1998: 276).

Recent archaeological efforts on the Tanzanian coast have uncovered six Neolithic sites on the islands of Zanzibar and Mafia, on the Rufiji Delta and in the Rufiji catchment areas and on the southern coast (Fig. 1) (Chami 2001a and b; Chami and Chami 2001; Msemwa 2001). ^{14}C dates from the Zanzibar cave site suggest that the cave was occupied from 2500 B.C., although the concentration of dates falls in the last millennium B.C. Objects recovered from the Neolithic horizons include microlithic and bone tools (Fig. 2), pottery (Fig. 3a-d), a pestle rubber (Fig. 3e) and fragments of stone bowls.

The recovery of pottery (Fig. 3a-d, Fig. 4a) and a short-barbed harpoon (Fig. 2n) similar to those found in the Rift Valley and the Nile Valley suggests that the WIOS Neolithic culture was part and parcel of the larger continental tradition. The most frequent pottery tradition is that called Narosura (Fig. 3a-d) dated in the Rift Valley to between 800-300 B.C. (Odner 1972; Bower and Nelson 1978). Several potsherds (Fig. 4a) with a hole near the rim have also been recovered from the coastal Neolithic horizons. In the Rift Valley and the Nile Valley, where this type of pottery is frequent, the holes are interpreted as 'hanging holes' (Sutton 1973: 148) or 'repair holes' or 'fish-net sinkers' (Haaland 1993: 71). Marine shells were used to make beads instead of the ostrich eggshells used in the Rift Valley.

Evidence for Domestication

The excavations of the Zanzibar cave and of the Rufiji sites are yet to offer any botanical evidence for plant domestication. However, the find of pestle rubber (Fig. 3e) and fragments of stone bowls, just like in the Rift Valley, may suggest plant food processing. Moreover, the find of a feature like a water channel in one of the Neolithic Rufiji horizons has generated a hypothesis of an irrigating civilization (Chami 2001a). Furthermore, if Casson's (1980) interpretation of Periplus word *oratoi* is accepted to mean 'soil tillers' or cultivators, then this mode of production would definitely have been going on in Azania for several centuries before the Christian era.

The strongest evidence for domestication, however, was obtained from the Neolithic horizon of the Zanzibar cave. The find of domestic chicken and cat bones associated with stone and bone tools suggest that the pre-EIW people had domesticated at least some animals (see Chami 2001a).

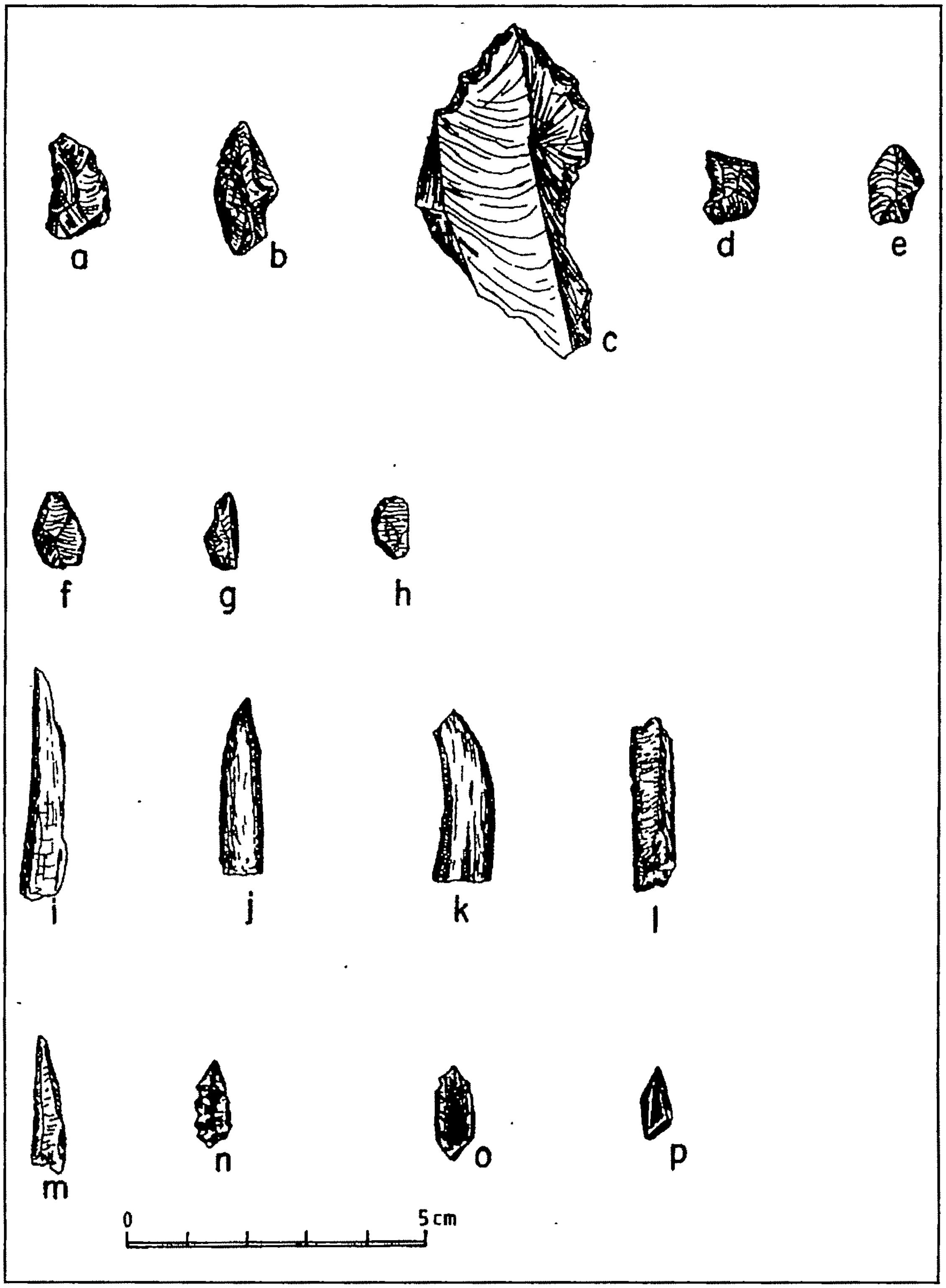

Fig. 2: The Zanzibar cave Neolithic artefacts; a-h = stone tools, i-p = bone tools

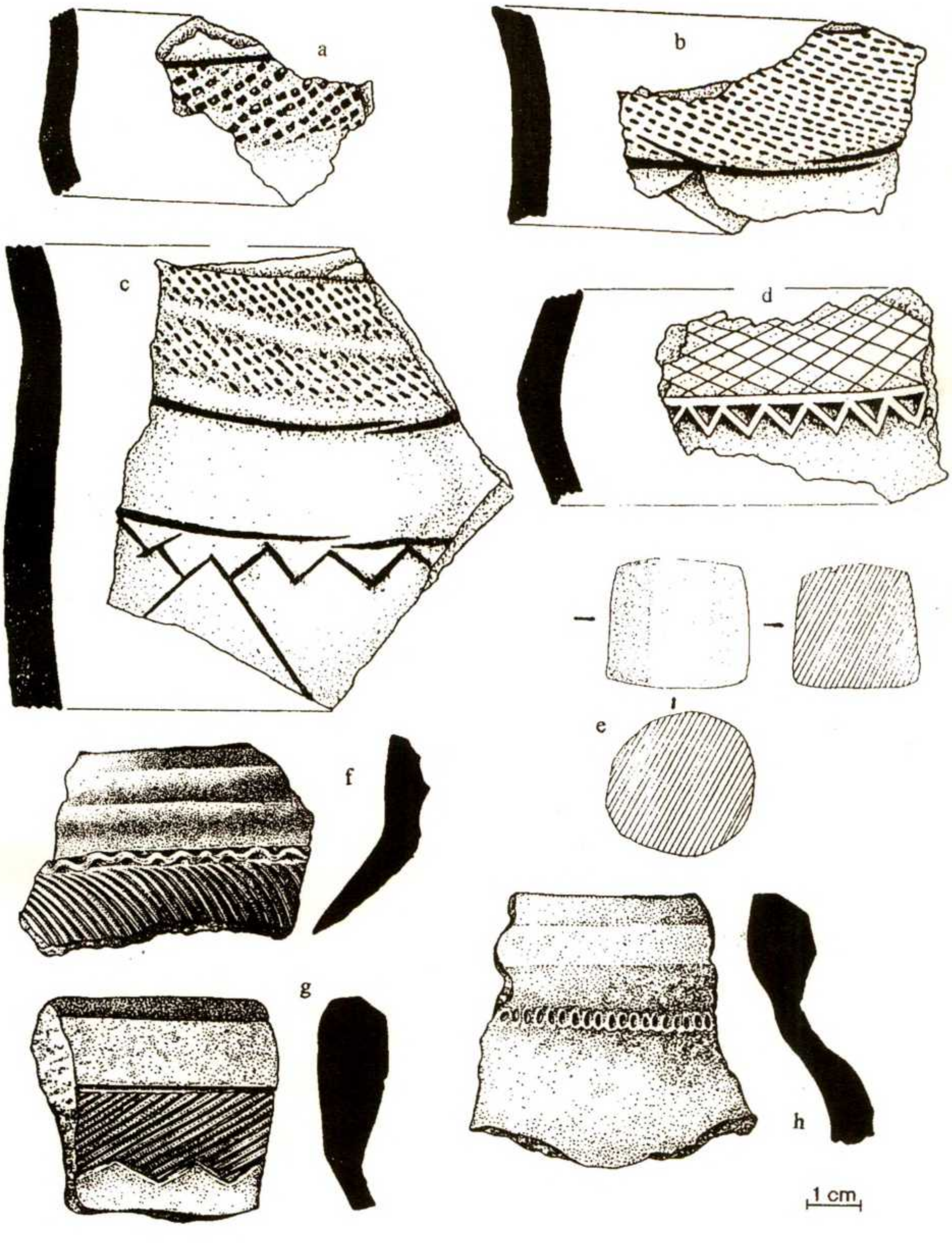

Fig. 3: a-d = Neolithic pottery from Tendaguru, south coast of Tanzania; e = pestle rubber from the Zanzibar cave; f-h = beveled/fluted pottery of EIW period from Mafia island, Tanzania

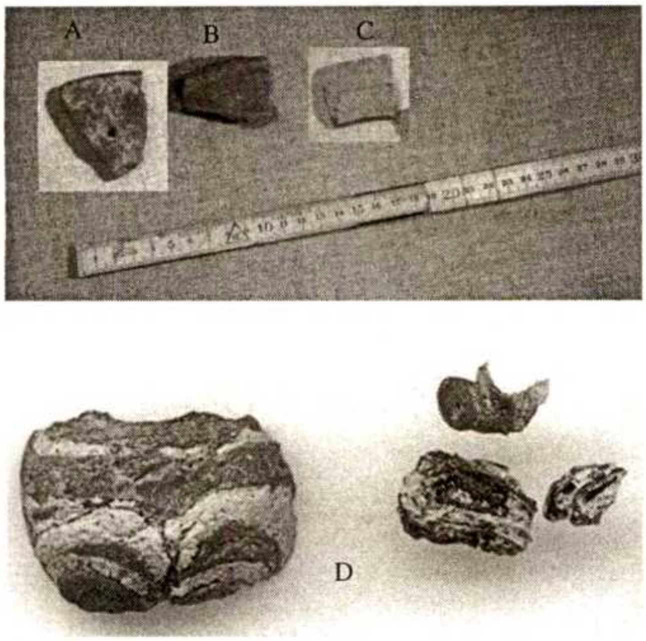

Fig. 4: a = Neolithic pottery with a hole from the Zanzibar cave; b = Roman/Indian red ware sherd from the Zanzibar cave; c = Roman sherd from Kivinja in the Rufiji region; d = Greco-Roman beads from the Juani cave, Mafia island

Evidence for Contact and Trade

Archaeological and historical sources can be used to show that the Neolithic people of the WIOS had been in contact with the rest of the world.

Evidence from animals and plants

Cattle: Marshall (1989) has found evidence for the cattle breed *Bos indicus* from the Rift Valley of Kenya dating to the last millennium B.C. Zoological evidence suggests that Zebu was first domesticated in Southeast Asia and spread to Africa from northwest India (for spread see Epistein 1971: 517-18).

Chicken: The excavation of the Zanzibar cave has also uncovered bones of chicken and cat domesticated in the Neolithic period dated to the last millennium B.C. or probably earlier (Chami 2001a). This becomes the earliest African chicken if we consider MacDonald's (1993:587) argument that 'we have no definite osteological evidence for the presence of domestic fowl in Egypt until the beginning of the Greco-Roman period (c. 332 B.C.)...' Zoological evidence suggests that chicken was first domesticated in Southeast Asia. Previously, scholars were of the opinion that chicken was first introduced to Africa through Egypt (Macdonald 1992, 1993). Since the Zanzibar chicken seems to be older than that of Egypt, it is safe to speculate that the former came directly from Asia through the Indian Ocean contact.

Furthermore, historical evidence suggests that chicken had been domesticated on the WIOS by the 3rd century B.C. The report of one Iambulus (Oldfather 1961: 79) suggests that the people living in the islands of the WIOS, at the equator, had chicken (fowl) as food. It is believed here that Iambulus reached and stayed on the islands of the WIOS because of the following reasons. First, he noted the existence of several islands, actually seven as they are today, on the coast of East Africa at or near the equator. Second, the subsistence and craft activities described by him are now attested archaeologically from the Zanzibar cave and now from Mafia Island (see Chami 2001a). Third, the following is the description of an animal which is convincingly identified as one of the Indian Ocean crabs: "for they are round... they are marked on the surface by two diagonal yellow stripes, at each end of which they have an eye and a mouth... It has beneath it all around its body many feet by means of which it can move in whatever direction it pleases" (Oldfather 1961: 75). The fourth factor can also independently be used to suggest that monsoon winds had been known since the Neolithic period. Iambulus and his colleague used it to travel from the Horn of Africa, in the south direction, for four months to the islands at the Equator, and when they went back home they travelled in the northeast direction, from the Equator islands, for another four months, to reach northwest India.

Banana: Botanical evidence has by itself suggested that the crop reached Africa, from Asia, so early that it has had time to evolve into many different cultivars (Simmonds 1962; Langhe *et al.* 1994-95). Recently Mbida and others (2000) have found banana phytoliths in Cameroon, Central Africa, in a context dating between 850-390 B.C.

Coconut: Botanical evidence also suggests that the coconut type found in the WIOS is the earliest variant that could reach East Africa only before the early centuries A.D. (Harries 1978: 305). Scholars interpreting the document of Periplus before Lionel Casson, including Müller and Schoff (see Casson 1980), report the export of coconut oil by the Azanians. If true, the crop must have existed on the WIOS for several centuries before Periplus. However, Casson (1980) has argued that there is no word for coconut in the Periplus section on Azania and Wigboldus (1994-5:112) has argued that coconut and other Asiatic domesticates reached the WIOS only in the 9th century A.D. On the other hand, the earliest archaeological evidence for coconut found so far, in the form of shells, is from the Misasa site, north of the Rufiji Delta, dating to the 6th-7th century A.D. (Chami 2001a).

Millet/Sorghum: Marshall (1989) has presented archaeological evidence showing that millet and sorghum, first domesticated in eastern Africa, are found in India and Arabian Peninsular respectively. It is argued that their spread to Asia could be dated to before the turn of the first

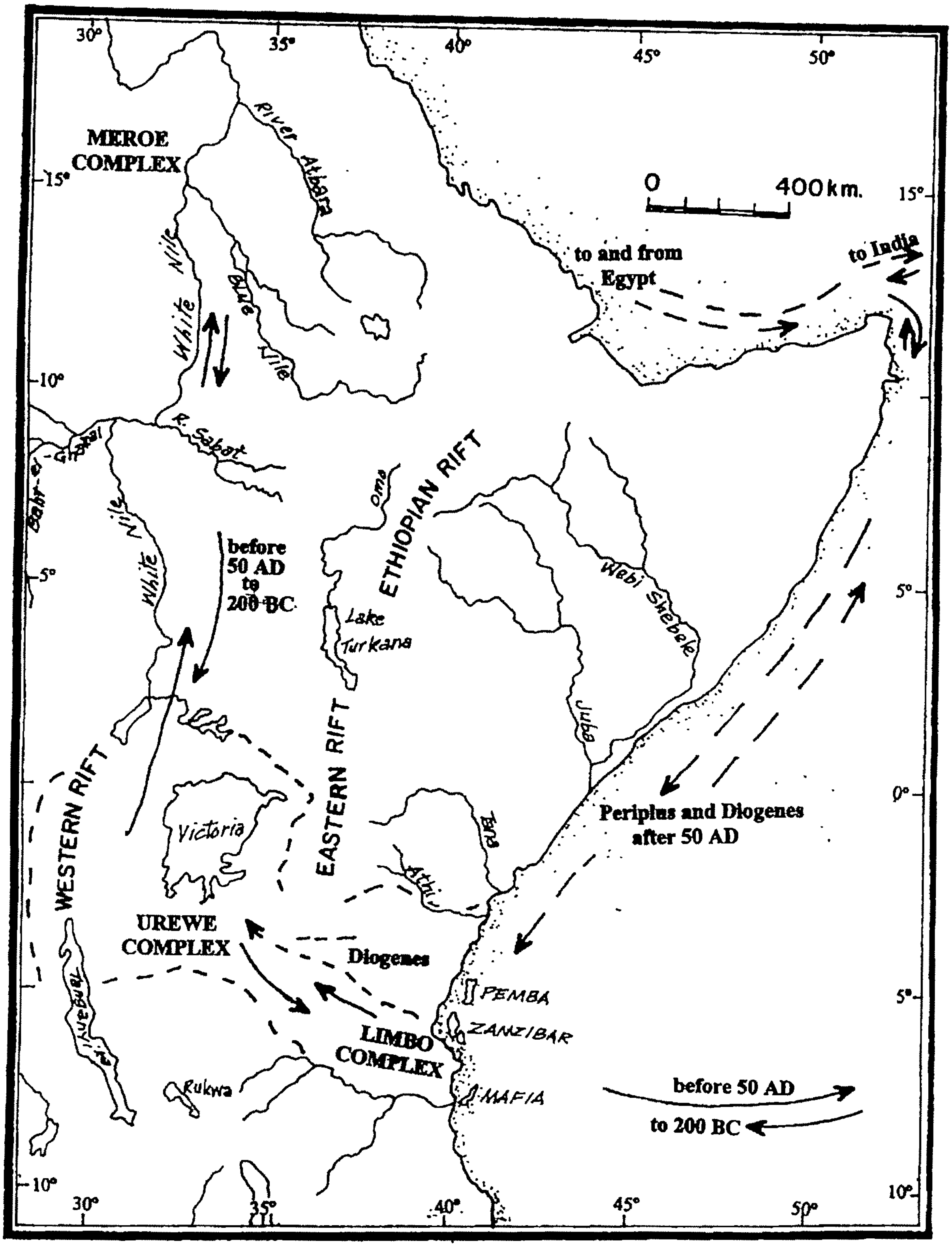

Fig. 5: A tentative model of the ancient trade network centering on the coast of East Africa

millennium B.C. (Marshall 1989: 238; MacDonald 1992: 307).

Cinnamon and Cassia: Ancient records suggest those Southeast Asian spices such as cinnamon and cassia may have reached the Red Sea and the Mediterranean region through an East African route. This route could have dated several centuries before the beginning of the first century A.D. when Pliny confirmed it. The East African 'cave dwellers', who had intermarriages with the people of the Red Sea (Ethiopia), brought the spices over a long sea journey (see Rackham 1961: 63) (for conspectus see Miller 1969; Casson 1984).

Evidence from other archaeological materials

Beads: Semi-precious stone beads including carnelian and agate, some probably of Indian origin, have been found in the Neolithic context in the Zanzibar cave and the Rift Valley sites of Kenya and Tanzania having dates ranging from 800-100 B.C. (Leakey 1966; Leakey and Leakey 1950). The Njoro cave in Kenya alone yielded 800 stone beads plus a faience bead, which Leakey (1971: 202) argued to be 'certainly of the imported origin'.

Cowry Shells: One of the Rift Valley sites found to have semi-precious stone beads include Ngorongoro Crator burial mounds. In the Neolithic context several marine shells, cowries, from the coast of East Africa were recovered (Leakey 1966; Sassoon 1968). Certainly this is evidence for the coastal-interior connection in the Neolithic period. This also offers a clue to a possible Neolithic inland trade route that was responsible for the spread of crops like banana to Cameroon (if not indigenous) and spices to the Red Sea and the Nile Valley (see Miller 1969; Chami 1999a).

More early classical reports

The involuntary visit of Iambulus to the WIOS, presented earlier, is said to have occurred in the third century B.C. Occurring in the same time period are many stories by Mediterranean writers about the land of Panchaea, on the WIOS, claimed to have been visited by people like Euhemerus and Eudoxus apart from Iambulus. Panchaea seems to have been an older version of Periplus' Azania, but more so of Pliny's Zangenae (see Casson 1989: 136) and Indicopleustus Zangion (see Tolmacheva 1986:106). Panchaea, as also put by Pliny, was known to have been trading spices to the Red Sea and Arabia. Diodorus reported of Panchaea having several centres, the largest being Panara (Cary and Warmington 1963: 241). The Greek travel records of the last three centuries B.C. have been considered to be utopian by Cary and Warmington (1964: 240). However, the reports are part and parcel of the same historical tradition that continued to the time of Pliny and the author of Periplus who lived in the first century A.D. It is quite strange that the reports of the latter have been accepted as real, but not those of the former. It should be noted that all the reports occurred in the period 300 B.C.-70 A.D., a period when the Greeks and Greco-Romans (including Phoenecians) had been sailing in all waters of the ancient world and keeping records of what they saw. The story that one Eudoxus, in his way back from India to the Mediterranean, was forced by monsoon winds to East Africa and his discovery that one could go around Africa is enough evidence that WIOS was known and visited by people from the rest of the ancient world. Indeed, although debatable, Egyptians are known to have gone around Africa, via the WIOS, in the end of the 6th century B.C. (see Cary and Warmington 1963: 111-12).

Early Iron Working Period: 200 B.C.-A.D. 500

Cultural Evidence

It should be reiterated here that the popular conception that people of the EIW culture, the Bantu-speakers, had not settled the littoral and islands of the WIOS can no longer be sustained. New research on the Tanzania coast and the islands show that the EIW culture was established there from probably 200 B.C. and survived to about A.D. 500.

Many sites with bevelled and fluted pottery (Fig. 3 f-h) associated with iron smelting materials and iron objects have been found to be concentrated in the Rufiji region and the island of Mafia (see Chami 2001b). Three phases of the EIW culture have been identified at Rufiji. The first was the Limbo complex with cultural affiliation to the Great Lakes Urewe Complex (Fig. 5) flourishing between 200 B.C. to A.D. 200. The second is Kwale tradition that was spread throughout the coast and islands of the WIOS and flourished between A.D. 200 to A.D. 400.The third is Mwangia tradition spreading on the Tanzanian coast and interior to central and southern Africa flourishing between A.D. 400-600 (Chami 1999c, Chami 2001b). The sites of EIW culture are found concentrated in the Rufiji region, some extending for kilometers, suggesting that the area had a dense population, probably larger than that of today (Chami 2001b). The find of trade goods, some from the Mediterranean world, would suggest that the region was a major staging area for long-distance trade.

On-going research on the island of Mafia has now exposed a stone house foundation of the EIW culture dating to before 200 A.D. (Chami 2000). Beads and pottery from the Roman world and elsewhere have also been recovered from the Zanzibar cave and Mafia dating to the EIW period. These discoveries, put together suggest complex exchange processes already reported by Periplus and Ptolemy.

Evidence for Trade and Contact

Archaeological evidence

Pottery: Red ware, green/yellow and other potsherds of the imported vessels have been found in the EIW horizon in the Zanzibar cave and in and around the Rufiji Delta. Several red ware potsherds, one of a rim and neck part of a vase (Fig. 4b) compare well with some of the Roman potsherds recovered from Ras Hafun (Smith and Wright 1988: 129, Fig. 5h). The examination of the sherd by classical scholars (Christina and her colleagues) at Uppsala Univeristy, Sweden, confirmed it to be part of a Roman vase. However, Marie Boussac and her colleagues from the University of Lyon identified the sherd as an Indian copy of the Roman red ware. Another Roman sherd (Fig. 4c) was recovered from the site of Kivinja near the Rufiji Delta associated with a green/blue sherd from Persia in the EIW context. Similar green and blue/yellow potsherds were recovered from the Zanzibar cave and also in the Ras Hafun context. It should also be noted here that Juma (1996) recovered from the Zanzibar site of Unguja Ukuu several Roman potsherds and alabasta from Egypt dated to the 5th-6th centuries A.D.

Glass Beads: Glass beads of Roman and Indian origin have also been found in the EIW context in the Rufiji, Mafia and Zanzibar. Of interest among the Roman beads is one segmented bead of gold/silver in glass supposedly made on the Rhodes Island in the Mediterranean Sea and dated to 100 B.C.-A.D. 200 (see Dubin 1987: 56; Chami 1999b). One glass bead found in association with EIW potsherds in the Zanzibar cave had been identified by Marie Boussac of the University of Lyon as 'monochrome glass of Indo-Pacific beads with the main centre of production in India at Arikamedu'. This would date to between 100 B.C. to A.D. 400.

Two glass beads, one being an 'eye bead', have been found in a disturbed context in Juani lime stone cave, Mafia Island. The small island of Juani is littered with many potsherds of EIW traditions as also a few found in the cave. The 'eye bead' (fragments in Fig. 4d) is certainly similar to the 'eye beads' illustrated by Dubin (1987: 60-61) and having dates ranging from 300 B.C. to A.D. 400. The other bead with stripes of colour (Fig. 4d) could also be of the same date. Bead specialists, Marilee Wood of South Africa and John Simpson of the British Museum have characterized the beads as a strange find on the WIOS. Simpson has identified the 'eye bead' as 'could be pre-Islamic- and there is evidence for both Roman and Partho-Sasanian beads from the Horn of Africa (i.e. Aksum and Ras Hafun)' (personal communications).

Objects found by chance: Coins of ancient Mediterranean and Asiatic Emperors were the first to be found and used as evidence that people of the rest of the ancient world had visited the WIOS. From Tanga, on the north coast of Tanzania, two Roman coins, one from the reign of Carus (A.D. 282-283) and one from that of Constans (minted A.D. 335-337) were found. A coin of Ptolemy Soter (116 – 108 B.C.) was sold to a German merchant in Dar-es-Salaam in 1901. The Zanzibar Museum has a collection of Persian coins of unknown provenance dating 1st-3rd centuries A.D. and others from other parts of the Middle East ranging in time from the 2nd century B.C. to the 14th century A.D. (see Chittick 1966: 157-57).

Historical literature

Fortunately, all authors have accepted as authentic the Greco-Roman literature about the WIOS/Azania that coincided with the rise of the EIW tradition. The most celebrated is the *Periplus Maris Erythraei* (commonly called Periplus of the Erythraean Sea and dated to 1st century A.D.), a guidebook for western traders interested in the WIOS, India and Southeast Asia (Casson 1989). This guidebook and Ptolemy's *Geographia* (Huntingford 1980) inform that the WIOS had trading towns the largest one being Rhapta located at latitude 8° south, near a great river. Only the Rufiji region qualifies for the two criteria. It should be reiterated here that the previous classical literature also mentioned several towns in Panchaea/Zangaea with Panara being the largest. The Periplus alludes to the international trade that went on at Rhapta, suggesting that the WIOS was a cosmopolitan place, as there were Arabs and Romans trading there.

Of further interest in Ptolemy's *Geographia* is the report of several individuals from the Mediterranean region who made regular visits to Azania/Rhapta. These include Diogenes and Theophilos. Diogenes is said to have travelled inland, probably through an EIW period trade route, to the Great Lake region, where he saw a mountain range, certainly Ruwenzori, providing water to a large lake, certainly Lake Nyanza (Victoria), which was itself the source of Nile (Huntingford 1980: 99, 173).

A later EIW Greco-Roman document, that of Cosmas Indicopleustus, written in about 6th century A.D., and from an Axumite base, informs about an interior route from Axum reaching a town near the coast south of Equator (see Freeman-Grenville 1975). Whether this town, called Sasu, was the same Panara/Rhapta that had changed name is yet to be found out (see Chami 2001b: 17). It should be noted that Ptolemy established Rhapta, like Sasu, a little bit to the interior about one degree longitude. Gold was one of the trade items of Sasu.

Conclusions

A few facts have now been established about the people and contacts in the ancient WIOS.

First, it is now known that Neolithic people had settled on the islands and the littoral from the beginning of the first millennium B.C. or probably earlier. Whether these people were Bantu speakers, as it is believed here, or were of other North African ethnicity remains to be properly demonstrated. The Neolithic people were probably the first to participate in a long distant trade network extending to the Mediterranean, the Middle East, India and Southeast Asia. Archaeology is now starting to show that trade links existed on the WIOS in the last millennium B.C.

Second, data has now been established showing that the people who were the first to work and use iron had inhabited the WIOS from about 200 B.C. Scholars agree that these people were Bantu-speakers. Archaeology has now shown that there was continuity from the Neolithic to the EIW cultures. The EIW culture flourished from 200 B.C. to A.D. 600 when it gave way to the Later Iron Working tradition reflected in the Triangular Incised Ware or TIW (see Chami 1998). Archaeological testimonies for trade and contacts in the EIW period are now being uncovered from the central coast of Tanzania showing brisk trade links with the rest of the ancient world. Greco-Roman literature of Pliny, Periplus and Ptolemy has strongly shown that there were trading communities on the WIOS during the EIW period.

Fig. 5 is a summary model showing how trade to the rest of the ancient world connected the WIOS in the EIW period.

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Looking for Connections: Southwest Arabia in Late Prehistory

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Abstract

The paper explores the role of Southwest Arabia in long distance trade networks prior to the emergence of the Iron Age in the region around 1000 B.C. The possibilities of a Neolithic-Bronze Age exchange network, connecting Yemen with the northern Red Sea, Persian Gulf and the wider Near East are investigated.

Introduction

Yemen participated in the trade networks that developed during the 1st millennium B.C. along the northern coasts of the Indian Ocean ultimately to connect the Mediterranean with the Bay of Bengal and beyond. The South Arabian states produced and controlled the incense that guaranteed the region an important place in this trade, and earned them a reputation for immense wealth. However, the role of southwest Arabia in trade networks prior to c. 1000 B.C., before the emergence of the Iron Age in South Arabia, remains an open question. The Red Sea is the western counterpart of the Arabian Gulf, through which maritime traffic linked Mesopotamia and the Indus during the 3rd millennium B.C. Did the Red Sea host an analogous sea trade during the Bronze Age?

Some scholars point to the adoption in Egypt of artistic motifs and architectural details native to Uruk Mesopotamia and Susa as evidence for circum-Arabian trade during the second half of the 4th millennium B.C. (Kantor 1965; see Moorey 1997 for an opposing interpretation). Other archaeological evidence attests to long-distance movement of materials during the 4th-2nd millennia B.C.: resins in incense burners and other vessels imply 3rd millennium traffic in frankincense from Dhofar to southeast Arabia and the Gulf trade network (Cleuziou and Tosi 1997); a copal ornament from 3rd millennium Mesopotamia derived ultimately from East Africa (Meyer *et al.* 1991); impressions in plaster of cotton textile from eastern Jordan (Betts *et al.* 1994) reflect connections with northeast Africa or (less likely) northwest India during the 4th millennium; domesticated sorghum and/or millets of presumed African origin appeared in Southeast Arabia by 3000 B.C., in Southwest Arabia by 2500 B.C., and in Northwest India by 2000 B.C. (Cleuziou and Costantini 1982; Costantini 1990; Weber 1998).

While these scraps of evidence attest to early long-distance connections, direct involvement of Southwest Arabia in these connections remains undemonstrated. Focused research into Yemen's prehistory, now little more than two decades old, has begun to reveal the region as home to multiple cultural traditions. During the Bronze Age, communities along the western and southwestern coastal plain (Tihama and Lahj) differed strongly from those of the western highlands and inner desert fringe in architecture, ceramics, and other aspects of material culture, while those of Hadramawt and Mahra to the east differed yet again (see Edens and Wilkinson 1998 for details). Moreover, these larger cultural sub-regions each contained numerous variations on the sub-regional themes. Little evidence indicates exchanges between the different sub-regions, much less with more distant trading partners before the late 2nd millennium B.C., and exotic raw materials are equally rare. In this regard Bronze Age Yemen differs strongly from the Gulf where foreign goods — especially pottery but other objects as well — are both relatively abundant and readily identifiable.

Yemen's apparent relative isolation before 1000 B.C. contrasts with developments after that date, and invites closer inquiry. This study examines two different kinds of evidence bearing on the prehistory of Yemen's economic relations with surrounding regions. The first part of the study concerns the distribution of various raw materials during the Neolithic (*c.* 7000-3500 B.C.) and Bronze Age (*c*. 3500-1000 B.C.).[1] The second part looks at the less tangible evidence of resemblances in certain aspects of material culture that seem to connect prehistoric Yemen with surrounding regions. The concluding discussion unifies the two classes of evidence and returns to the question that opened the study.

Circulation of Raw Materials

Obsidian, a key material for appreciating prehistoric exchange networks, provides a semi-quantitative index for the circulation of materials within Southwest Arabia and between this and adjoining regions. Other less ubiquitous and often less noticeable raw materials provide corroborative evidence.

Obsidian

Yemen contains numerous obsidian sources, a comprehensive inventory of which has not yet been made. The best-documented sources form a belt that includes Jabal al-Lisi, Jabal Isbil and several other confirmed sources in Dhamar (see Francaviglia 1990; Wilkinson *et al.* 1997: 122). Other sources in the highlands range from Taizz in the southern highlands to Jabal Nabi Shu'ayb in the central highlands, and additional sources are known or suspected in Southwestern Saudi Arabia (Overstreet *et al.* 1988 map 12.1; Zarins 1990: 515). Obsidian sources are also reported from the coast west of Aden and in Southwestern Hadramawt, although these are considered dubious (Zarins 1990: 347) and are not taken into account here.

Obsidian unsurprisingly provides a high proportion of chipped stone assemblages from many Neolithic sites in the central highlands. In the Dhamar area, obsidian forms up to 97% of excavated assemblages and surface collections from sites within 25 km of the al-Lisi sources. Assemblages from Wadi Dhahr, near Sanaa and some 15 km from a reported source at Huqqa (Rathjens and von Wissmann 1934: 174) and 30 km from the Nabi Shu'ayb sources, usually contain 15-20% but occasionally over 40% obsidian (Kallweit 1996). Obsidian becomes markedly more rare with distance from known sources. In Khawlan (the highland district east of Sanaa) obsidian accounts for 9% of the surface collection from WTHiii (di Mario 1992, fig. 2). Obsidian is relatively infrequent in the excavated sample (de Maigret 1984a: 437), and is present in unspecified amounts in other sites of the same area (de Maigret 1983:342). These sites lie roughly 70-80 km from the Dhamar sources and 60-70 km from the Huqqa source. In the northern highlands obsidian appears in trace amounts, e.g. around Sada 180 km north of Sanaa (Cleuziou *et al.* 1992:16; de Bayle des Hermens 1976: 22, 25-26); in the Southern Asir Highlands of Saudi Arabia even further north Neolithic assemblages typically contain less than 2% obsidian and flint (Zarins *et al.* 1981: 21), despite the suspected source in the area. East of the highlands, Neolithic assemblages in the Ramlat al-Sabatayn includes obsidian in minor amounts: obsidian comprises 4% of the systematic collection from HARiii (di Mario 1989, fig. 5) and is present in other assemblages (Inizan and Ortlieb 1987: 18). These sites are 170-270 km distant from known sources. Obsidian also appears (never more than 2%) in Neolithic sites of the western Rub (Edens 1988: 37) and adjoining districts as far north as the central Nejd (Zarin *et al.* 1981: pl. 5C) and as far east as the interior of Dhofar in Oman (Zarins 1997a: 256), i.e. up to 1000 km from known or suspected sources. In the Tihama coastal plain west of the highlands, obsidian again seems to figure as a raw material secondary to other volcanism in 6th-5th millennium B.C. sites, 80 km or more from known obsidian sources; however, at some sites up to three-quarters of the retouched tools are made on obsidian (Tosi 1985: 365; 1986: 402, 407).

A similar but more muted picture emerges for Bronze Age sites. Obsidian dominates many lithic assemblages from the highlands, especially in the Dhamar area where numerous sources lie close to hand. But even there some assemblages emphasize felsites and other volcanics despite lying just 25-30 km from several obsidian sources. Elsewhere in the highlands obsidian often is a minor constituent of lithic assemblages, e.g. 2-7% at sites in Khawlan (di Mario 1990), only occasionally present in collections in Wadi Dhahr (Kallweit 1996: 45, 49, 50, 54). Archaeological obsidian occurs in distinctly lower proportions than in the Neolithic assemblages of the same areas. Obsidian makes a very uneven appearance outside the highlands. In Tihama, systematic samples from one Bronze Age site show 3% obsidian among the chipped stone (Tosi 1985:368). East of the highlands, surface collections from sites along Wadi Hirab (a north tributary to Wadi Jawf, over 100 km from known obsidian sources) include obsidian but quantitative data are lacking (Cleuziou *et al.* 1992:19). Obsidian occasionally appears in Hadramawt, e.g. 2% of flakes at Munayder (where the obsidian may in fact be Iron Age; McCorriston 2000, table 3). Two obsidian blades occur among mortuary goods in a tomb (Vogt and Sedov 1993); these sites are 450-500 km from the highland sources.

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[1] The absolute chronology of these two broad periods is not yet well worked out in Yemen. Published radiocarbon dates for Neolithic sites begin in the 7th millennium cal B.C. and run through the 4th millennium. In the highlands the earliest Neolithic date falls around 3700 cal BC and the latest dates associated with Bronze Age occupation around 3100 cal BC. Although the Bronze Age data are less developed on the coastal plain, a ceramic Bronze Age seems to begin in the 3rd millennium and perhaps also by the late 4th millennium, while in the east (most of Hadramawt and Mahra, and also Dhofar in Oman) the Bronze Age appears to have been aceramic and remains poorly defined for the most part. See Edens and Wilkinson (1998) for an overview of the chronological evidence, to which add Vogt (2000) for the west coast and McCorriston *et al.*(in press) for Hadramawt. The absolute dates stated here are therefore rough estimates only.

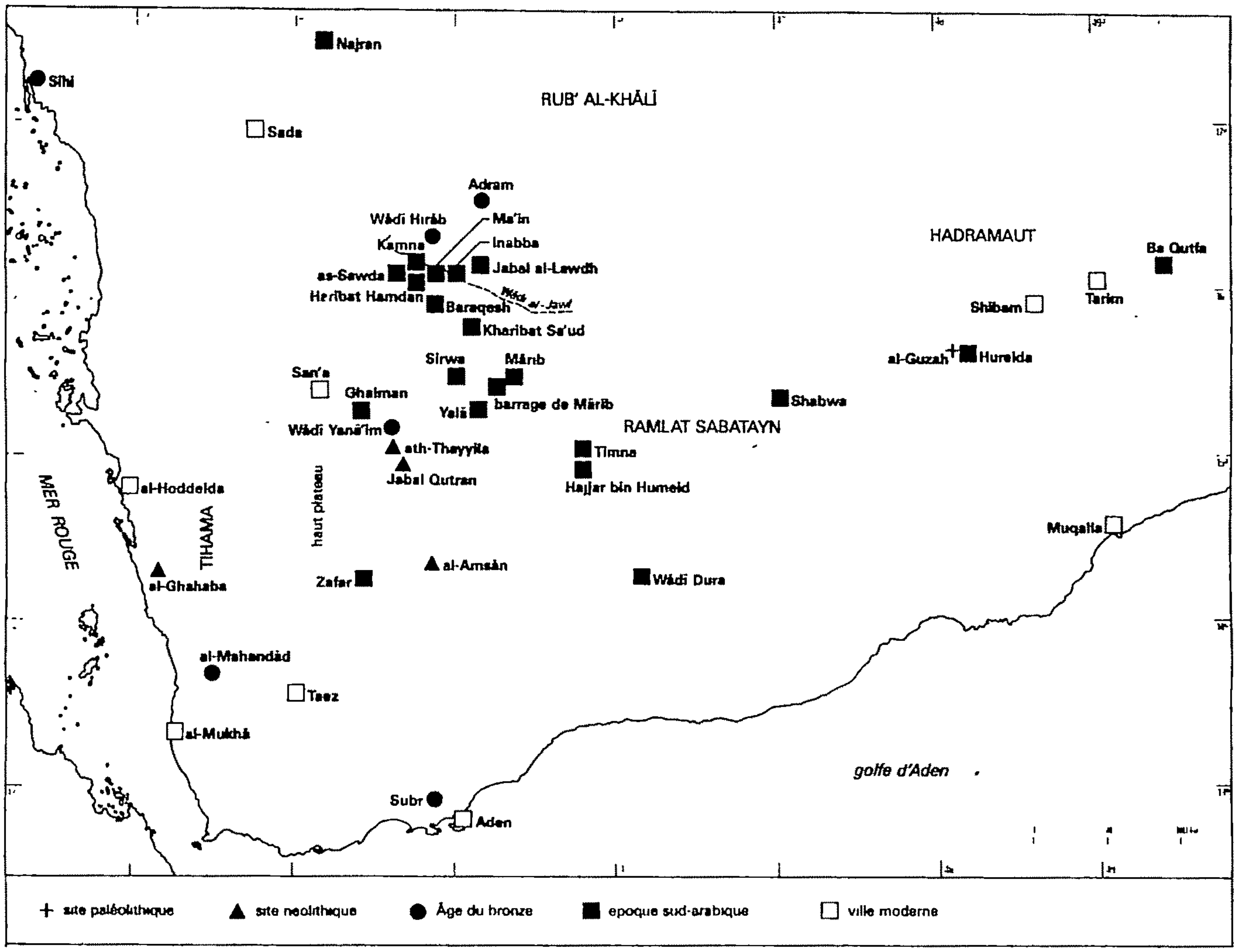

Fig. 1: Archaeological sites in Yemen

In contrast, the late 2nd millennium-early 1st millennium B.C. geometric microlithic assemblage at al-Midamman in Tihama is almost exclusively obsidian (Keall 2000: 725), while at the contemporary urban center of Sabr near Aden, obsidian is the basic raw material for stone tools and commonly figures among debitage (Vogt and Sedov 1998:264). Obsidian beads also appear (Vogt n.d.). A similar geometric microlithic industry in obsidian typifies early 1st millennium B.C. assemblages in the desert fringe (Rahimi 1987), and also appears from Hadramawt to Dhofar both in obsidian (Caton Thompson 1944: 134-135) and in other materials (McCorriston 2000: 143, Zarins 1997b: 672-673). This microlithic industry, a minor hallmark of the early South Arabian civilization, reveals a relatively high-volume and moderately long-distance (minimally 100 km) circulation of obsidian from the highlands.

Sourcing studies by chemical and trace element analysis of Southwest Arabian obsidian sources and archaeological samples are still in their early stages, and many sources have not yet been located and identified. Moreover the analytic situation is both complex and ambiguous, with Southwest Arabian and Ethiopian sources often failing clearly to separate (Zarins 1990: 527-30, 534). Depending on the analytic approach, the individual sources within the Dhamar belt–the most studied sources–may be indistinguishable from each other (the salient published exception being the TKY-5 source, Francaviglia 1990; Zarins 1990: 527 subgroup A) and the same analytic cluster may also include sources elsewhere in southwest Arabia or in Ethiopia (Zarins 1990: 528).

The lack of analytic discrimination not withstanding, the results in hand do contain points of interest. Francaviglia's work indicates multiple sources for Bronze Age archaeological obsidian in Khawlan, one being Jabal al-Lisi. Obsidian indistinguishable from the Dhamar (and East African) sources appeared in several Neolithic sites of Khawlan (Francaviglia 1990), in the Ramlat al-Sabatayn (di Mario 1989: 120 n. 4), and in Dhofar (Zarins 1997a: 256). However, Dhamar obsidian seems rarely if ever to have reached Tihama during Neolithic and Bronze Age time. Most obsidian from coastal sites forms two clusters, Zarins' subgroups D and K. The source(s) of neither cluster is identified but both seem most compatible with Ethiopian and Eritrean sources and both are incompatible with the Dhamar sources (Zarins 1990: 528-530). Obsidian from Neolithic sites in Southwest Saudi Arabia also falls in subgroup D, and Zarins (1990: 531) posits a source in the Southern Asir that supplied communities both of the interior and of the Red Sea coast. The coastal distribution of subgroup K obsidian, more likely from an African than from an Arabian source, may mark 'the development of an extensive sea trade beginning in the early 2nd millennium B.C. and continuing in the Sabaean period' (Zarins 1990 531-32). Looking farther afield, some obsidian from Naqada II contexts (*c.* 3500-3200) in Egypt might derive from the TKY-5 source in the Lisi-Isbil belt (Zarins 1989: 366-367),[2] and the obsidian used to make a Second Intermediate period (*c.* 1720-1550 B.C.) bowl may have had an Arabian source (Zarins 1989: 367). Recent analysis reaches similar conclusion of Ethiopian or Arabian sources for Egyptian obsidian (Bavay *et al.* 2000).

The obsidian evidence indicates several characteristics of intra- and inter-regional exchange in Neolithic and Bronze Age southwest Arabia. The distribution of obsidian implies a sharp fall-off with distance from sources, at least by comparison with patterns of circulation in northern sections of the ancient Near East. At the same time some obsidian did escape the highlands to circulate at significant distances from the sources. This distribution pattern probably reflects both logistical restrictions on circulation (perhaps combined with the operation of social/economic boundaries) within the highlands and the relative effectiveness of down-the-line exchange under easier topographic conditions further removed from the sources, especially toward the interior of the Arabian peninsula. Communities along the coast may have obtained obsidian from highland sources but equally seem to have drawn on East African sources, implying an emerging maritime traffic already by Neolithic times; the relative contribution of Arabian versus East African sources remains impossible to estimate. Lastly, the amounts of obsidian in circulation within the highlands seem to have remained at high levels close to sources throughout the Neolithic and Bronze Age periods, but the amounts moving to more distant destinations outside the highlands seem to have declined during the Bronze Age and then risen sharply again toward the end of the 2nd millennium B.C.

Other materials

Other raw materials that potentially identify Neolithic and Bronze Age exchange networks include other stones (various chalcedonies, amazonite, steatite, alabaster), marine shell, and metals (notably copper).

Yemen is renowned for its chalcedonies (including carnelian, agate, onyx). These semi-precious stones appear in volcanic formations of the highlands from Shahara in the north to south of Taizz, with centers of recent production in the Anis district northwest of Dhamar and Wadi Sirr just northeast of Sanaa (Inizan *et al.* 1992: 161-162; see also Overstreet *et al.* 1988 map 12.1). Evidence for production of beads from chalcedonies and other stones appears in Neolithic sites in Tihama (Tosi 1986: 408-414) and the Ramlat al-Sabatayn (amazonite, the source of which is unknown; di Mario 1989: 139-41) and in a Bronze Age site in Dhamar (unpublished). Finished beads and pendants are reported from one Neolithic site in the Sanaa area (Kallweit 1996: 62) and somewhat more frequently from Bronze Age occupations in the highlands (Zarattini 1990: 76; Kallweit 1996: 94; also unpublished examples from Dhamar). Chalcedony beads appear at Sabr, near Aden, although not in great numbers (Vogt n.d.). Stone beads are somewhat more common in Bronze Age tombs (carnelian beads appear in almost every tomb excavated at Jabal Jidran, Braemer *et al.* in press; carnelian and agate beads occur much more irregularly in tombs in Hadramawt, Vogt and Sedov 1993). The beads in Hadramawt imply circulation of these materials some 400+ km outside their primary source areas. The beads at Ruwaiq/Jidran also imply long distance (150 km) transportation of these stones.

Small stone rings of varied raw materials are a relatively common feature of Neolithic sites in the highlands (Fedele 1986: 397; Kallweit 1996: 154-56), and also appear in Tihama (Zarins and Badr 1986: 44) and the Ramlat al-Sabatayn (di Mario 1989: 139, fig. 14.6). The rings seem often to be made of locally available materials as exemplified by the nearly two dozen (a quarter of them unfinished) from sites in Wadi Dhahr, roughly half of which are made from a gray-white stone available within several kilometers of the sites (Kallweit 1996: 156).

Yemen is also known for its soapstone (steatite, chlorite), the sources of which lie in the north of the country and into the Southern Hejaz and Western Nedj (see Overstreet *et al.* 1988: 392-404, fig. 12.07). Steatite vessels are a common feature of later sites throughout the country, and the material was abundantly used as a tempering material in 1st millennium B.C. pottery. Steatite vessels appear on several Neolithic sites in the western Rub al-Khali and the adjacent areas to the west and north (summarized in Edens 1988: 37-8) and also in Dhofar (Zarins 1997a: 256). In Yemen, however, worked steatite appears in few Neolithic sites (e.g. HARiii in the Ramlat al-Sabatayn, di Mario 1989: 137; two sites in Wadi Dhahr, although one of these sites is uncertainly Neolithic while the vessel from the other gives the appearance of being a later product (Kallweit 1996: 78, 92). Bronze Age sites are equally poor in reported steatite finds: published examples include a vessel in a Wadi Dhahr site (Kallweit 1996: 52), another in a Tihama site (Tosi 1985: 368-9), and several worked pieces at Shabwa at the western end of the Wadi Hadramawt (Badre 1991: 234). A class of microbeads (0.5-1.5 mm in diameter) made of a white material tentatively identified as baked steatite appears in tombs at Jabal Jidran (early 3rd to mid-2nd millennium B.C.; Braemer *et al.* in press), and at two sites, one dated to *c.* 2700 cal B.C., in the Dhamar district of the highlands (unpublished). The raw material(s) of these beads must be corroborated before they may enter the discussion–judging by recent analysis of the material of similar beads in the Gulf (Benton 1996: 113) which shows that they are not steatite.

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[2] In light of the analytic ambiguities involved in this identification, Francaviglia's (1990:132) comment on the TKY-5 source bears remembering: "given its poor mechanical features... this Trap obsidian is not very likely to have been used in making tools."

Alabaster (calcite, fine crystalline limestone), available in limestone formations that outcrop in northern sections of the highlands and in Hadramawt, was a medium for masterful works of South Arabian craftsmen but seems to have been little used during prehistory. The reported occurrences are limited to a re-used bowl fragment at HARiii in Ramlat al-Sabatayn (di Mario 1980: 137-138), a possibly alabaster bead from a Bronze Age tomb in Hadramawt (Vogt and Sedov 1993), and pendants at Sabr near Aden (Vogt n.d.).

Cowries and dentalium shells from the Red Sea and the Indian Ocean appear in many Neolithic sites of the Ramlat al-Sabatayn, the Rub al-Khali, and the areas adjacent to the west and north (summarized in Edens 1988: 38) and also the Dhofar interior (Zarins 1997a: 256), but are a less frequent component of inventories from Neolithic sites of highland Yemen (e.g. probable Cypraea in Khawlan, Fedele 1988: 36). Rings of *Strombus* or *Conus* shell also sometimes appear in Neolithic sites of these same areas (Kallweit 1996: 89, Taf. 21). The smaller amount of shell reported from highland sites may be a function of visibility, as sites in the Ramlat al-Sabatayn and the Rub al-Khali are usually deflated surface scatters while those in the highlands often are contained within palaeosols.

Marine shell only occasionally appears in Bronze Age habitations of the highlands and desert fringe, but are more common in the tombs of this period. Grave goods in tombs and related monuments suggested to date to *c.* 4500-2000 B.C. on the Southern Jol (Hadramawt) often include marine shells (mostly *Engina mendicaria* and *Conus* sp.) pierced as beads, pierced apical segments of *Conus*, and pendants and decorated discs of nacrous (cf. *Pinctada* sp.) and other shell (Vogt and Sedov 1993). Vertebrae of sharks and/or rays were also used for bead making. These materials reflect circulation of marine resources in fairly large amounts up to 100 km from the coast. In contrast, the excavated tombs at Jabal Jidran (radiocarbon dated to the early 3rd and mid-2nd millennium B.C.), north of Marib and roughly 300 km from the Red Sea and Indian Ocean, contain only a few shell beads and none of the other shell objects found on the southern Jol.

Although metal ores are not as abundant in Yemen as in Oman or Saudi Arabia, Southwest Arabia does contain sources of gold, silver, lead, and copper, the latter most richly near Bayda (Overstreet *et al.* 1988: 411, fig. 12.01). Investigation of ancient ore mining and metallurgical technologies in Yemen has been limited, several Iron Age and early Islamic gold mines in the desert fringe being the notable examples (Overstreet *et al.* 1988: 413-415; Mallory-Greenough *et al.* 2000). Islamic mining and smelting operations in Southwestern Saudi Arabia have also been identified (Hester *et al.* 1984). The distribution of metal ores available to a pre-modern industry is insufficiently understood even to begin to suggest possible sources for Yemen's prehistoric metallurgy. In any case, metal finds are generally rare even late into the Bronze Age, and except for the occasional gold adornment in such coastal sites as Sabr (Vogt n.d.) and a piece of worked lead in a (ritual) platform in Hadramawt (Vogt and Sedov 1993), are confined to copper and copper alloys.

The early 3rd millennium tombs at Ruwaiq and Jidran provide the earliest metal yet reported from Yemen — a few pieces of copper/bronze including an awl. Metals occasionally also appear in tombs in Hadramawt (four pieces of copper, including a small projectile point, and a piece of worked lead; Vogt and Sedov 1993). Metal objects are even rarer in habitation sites, the inventory being limited to two objects, one a surface find, from Khawlan (de Maigret 1990: 22, 46). Metals are strikingly more common from late 2nd millennium/early 1st millennium B.C. contexts in Tihama and Lahj, where multiple sites have yielded a range of copper axes, adzes, awls, knives/daggers, fish hooks, needles, spatulas, and rings (Vogt and Sedov 1998: 263-4; Keall 2000: 725; Tosi 1986: 403-4; Zarins and Badr 1986). Analysis of eleven metal weapons and tools placed beneath a basalt pillar in the mortuary complex at al-Midamman (Keall 1998) indicates that half the objects are made from unalloyed copper or low (up to 2.5%) arsenical copper, with the remainder fashioned from a low (up to 3.5%) tin alloy (Giumlia-Mair *et al.* 2000). Cassiterite sources appear in western Saudi Arabia and also near Sada in northern Yemen (Overstreet *et al.* 1988: 412). Eastern Egypt offers more distant sources of tin. The Midamman work represents the first published metallurgical analysis of prehistoric metals from Yemen, and it remains unclear how representative these results are of late prehistoric Tihama. Metallurgical slags concentrated in one portion of Sabr imply local production (Vogt and Sedov

1998: 263). Despite the apparent sharp increase in the use and circulation of metals, stone (often or usually obsidian) tools continued in common use well into the 1st millennium.

These materials corroborate the picture obtained from obsidian: most raw materials and goods circulated within Southwest Arabia only short distances from their sources, with a wider penumbra of low-volume exchange over longer distances. Judging by the chronological distribution of chalcedony beads and by the spatial distribution of metalwork, the Bronze Age decrease in long-distance movement of obsidian is not an accurate representation of the intra-regional situation in general. However, the late 2nd/early 1st millennium increase in volume and efficiency of long-distance circulation is repeated in the other evidence. South Arabian sites in the desert fringe and in Hadramawt typically contain far greater amounts of steatite, alabaster, chalcedonies, and metals than do Bronze Age sites anywhere in Yemen. Moreover, exchanges of pottery between different regions of Southwest Arabia can be observed for the first time, with a few pieces of coastal pottery appearing in the desert fringe and in Hadramawt, and a piece of Hadrami pottery appearing at Sabr (Vogt and Sedov 1998: 266-267; Zarins and Zahrani 1985: 95-96).

Culture Complexes and Interaction Spheres

The evidence of durable materials such as obsidian and other stones, manufactured goods, etc. have the advantages of empirical reality, but without a conceptual framework on which to hang the interpretation of these objects, they remain silent. Furthermore, the physical evidence for interregional interaction of prehistoric Yemen with its neighbours, taken item by item, is under whelming. Indeed, one is struck by how limited seems to have been the circulation of raw materials within Southwest Arabia. At the same time, various scholars have drawn on several realms of 'stylistic resemblance' to bring prehistoric Yemen into the ambit of Arabia (and the southern Levant) and northeast Africa.

Yemen, Arabia and the wider Near East

Prehistoric Yemen's connection with other parts of Arabia and, to some degree, the Southern Levant lies in the 'family resemblance' of domestic architecture, mortuary architecture and art, and pottery. When he initially reported a Bronze Age for Yemen, de Maigret (1981: 6) suggested formal similarities with Levantine pottery, and later drew parallels more specifically with EB I and IV forms of the Southern Levant (de Maigret 1984b: 104, 1990: 218). More recently Kallweit (1996: 150-153) developed this theme by pointing to precise formal parallels with Chalcolithic and EB I Palestine (specifically, with Teleilat Ghassul and Arad) and with Maadi in Egypt, and proposed to push the beginning of Yemen's Bronze Age back to c. 3500 B.C.[3] The absence from Western Saudi Arabia of reported sites with similar pottery leave these proposals difficult to assess.

At the same time, Western Saudi Arabia hosted the 'Southwest Asian Pastoral Techno-complex,' an archaeological construct referring to the distribution of similar cultic and mortuary monuments and domestic architecture across a wide portion of the Arabian peninsula as manifestation of related herding populations (Zarins 1992a, b). An even wider construct, the 'Arabian Megalithic Complex' (Newton and Zarins 2000), encompasses the mortuary and associated structures across Western and Southwestern Saudi Arabia and into Northeastern and Eastern Yemen, with strong architectural similarities to the tomb architecture of sedentary Bronze Age cultures in eastern and southeast Arabia. In Hadramawt and Mahra monuments appear that incorporate stelae on which are incised or executed in bas-relief male figures–typically represented by face and arms together with a sword or dagger and other objects. The dagger characteristically has an exaggeratedly lunate pommel of a type depicted on rock art elsewhere in Arabia; the same type of dagger is depicted in art and exemplified by exemplars in Syro-Palestine and Mesopotamia between *c.* 2700 and 1800 B.C.[4] Newton and Zarins (2000: 169) associate this dagger type with pastoralist elites who were responsible for the Arabian Megalithic Complex as part of their efforts to sustain a socio-political ideology that upheld 'the ever-expanding search for copper, silver and gold especially within the Western Arabian shield zone.' In this connection, 2nd millennium metalwork in Tihama finds some perhaps deceptive parallels with Syro-Palestinian forms (Keall 1998: 144).

While some aspects of the proposed techno-complex may well reflect functional convergence rather than necessarily cultural-historical relationships (e.g. curvilinear domestic architecture), these formulations do seem to capture the basic reality of an Arabian Bronze Age pastoralist adaptation. Reliance on animal herds entailed high degrees of mobility in most sections of the peninsula, and the possibility of vertical transhumance at the edges of highland Yemen. Mobility in turn offers a mechanism for circulation of goods across a pastoral group's customary territory, and down-the-line exchanges between groups distributed ever smaller amounts of goods to ever greater distances from raw material sources. Even jettisoning aspects of the European model of megalithic-building elites that are less appropriate to an Arabian setting, the mortuary/cultic architecture may still usefully be interpreted as territorial markers the construction of which drew on corporate labour as one manifestation of an almost peninsula-wide interaction sphere (the latter phrase in its original, North American sense, i.e. circulation of elite materials, iconography and social symbols across social boundaries that separate communities of otherwise different material culture).

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[3] The current radiocarbon chronology for the southern Levant dates the 'Developed Chalcolithic' (to which phase Ghassul belongs) to *c.* 4500-3700 cal BC and the 'Terminal Chalcolithic' (with which Maadi correlates) to *c.* 3700-3500 B.C. (Joffe and Dessel 1995). To sustain the parallels Kallweit cites the beginning of Yemen's Bronze Age should therefore be pushed even earlier, but at that point a conflict emerges with the radiocarbon date of roughly 3800-3650 cal BC from a Neolithic site in Wadi Dhahr.

[4] Short daggers with crescent pommels also appear in southeast Arabia, most commonly in Iron II (i.e. 1100-600 B.C.) contexts (Potts 1998:192). These daggers are cast as a single piece, including the pommel, in contrast to the separate and often non-metallic pommel of the Bronze Age daggers of Syro-Palestine and Mesopotamia. As the nature of the dagger pommels depicted on the stele is not obvious, this technical difference is moot and the stelae may date to the 1st just as easily as to the 3rd millennium B.C.

The Arabian Bifacial Tradition (ABT) characteristic of Neolithic sites across much of Arabia may be considered the antecedent analog of the Bronze Age pastoralist techno-complex. Defined by a loose set of common features in material culture found through much of the Arabian Peninsula (including Yemen), the ABT also expresses a set of economic orientations that combine in varying mixes hunting, foraging, animal herding, and fishing. Domesticated cattle, sheep and goat appeared in southwest Arabia by the early 4th millennium B.C. if not during the 5th millennium B.C. (see Edens and Wilkinson 1998 for a summary of the evidence, to which add McCorriston *et al.* in press); agriculture based on wheat, barley and other Near Eastern cultigens plus sorghum made a definite appearance in the region by the early 3rd millennium B.C., and some indirect evidence suggests farming a thousand years or more before (Wilkinson 1999: 186; McCorriston *et al.* in press). The timing and staggered appearance of animal herds and farming in Southwest Arabia parallels developments in Eastern and Southeastern Arabia in both respects (5th and late 4th millennium B.C. respectively; the identification of 5th millennium B.C. sorghum in Oman has now been withdrawn, Biagi and Nisbet 1992). Most of the species in question belong to the 'Neolithic package' that aceramic Neolithic groups of the Levant, Anatolia and the Zagros range had developed by the late 7th millennium B.C. While the route(s) by which these species reached Southwest Arabia remains uncertain, a route via Northeast Africa seems unlikely since food producing economies did not appear in such regions as the Eastern Sudanese-Ethiopian borderlands until the 3rd millennium B.C. (Fattovich 1990: 14, 17-22; as in Arabia, herding appeared before farming in these regions). The coincident schedule instead suggests the introduction of domesticates around the Arabian Peninsula via the social and economic networks of sub-regional interaction that underlay the Arabian Bifacial Tradition as a techno-complex — without special appeal to connections between the Gulf and PPNB Levant or Ubaid Mesopotamia (Uerpmann and Uerpmann 1996: 133).

Northeast Africa

The decorative techniques and styles of Bronze Age pottery in the highlands and along the western coastal plain suggest to many scholars a relationship with the prehistoric traditions of northeast Africa. De Maigret (1990: 218) briefly raises the possibility that the decoration in impressed or stamped curvilinear bands characteristic of the highlands arose from an ultimately Sudanese origin, i.e. he notices a family resemblance but not necessarily a direct transfer late in the 4th millennium B.C. to Yemen of pottery in a particular cultural style. Fattovich (1993: 443-444) emphasizes ceramic links across the Red Sea, both as traded items and as a shared cultural sensibility, and adds (Fattovich 1997) other evidence to outline a three-phase history of interactions across the southern Red Sea. From the 7th to the 4th millennium B.C. obsidian from several African sources reached Southwestern Arabia and also, by the 4th millennium, Egypt. These exchanges intensified during the 3rd and 2nd millennium B.C., perhaps under the stimulation of increased Egyptian commerce, with resulting movement of cultural styles (rock art, pottery decoration, chipped stone) between East Africa and Arabia. These interactions culminated in the mid-2nd millennium appearance of a "coastal Afro-Arabian cultural complex" with stylistic connections to Nubian (Kerma and C-Group) cultures, and relations with the emerging pre-state societies in Ethiopia. Early in the 1st millennium even stronger interaction encouraged state formation in Ethiopia with the heavy cultural imprint of the South Arabian civilization.

Closer examination of the archaeological evidence upon which Fattovich erects his developmental sketch reveals shaky foundations. In addition to the uncertainty of obsidian sourcing, the ceramic links between the two sides of the southern Red Sea are a family resemblance in decorative technique but normally differing considerably in form and decorative composition. Not until late in the 2nd millennium B.C. does a little African pottery appear at places like Sabr in southwest Arabia (Vogt and Sedov 1998: 266, nn. 4, 6), along with a few other objects of African origin such as a piece of worked ivory, and an Egyptian faience (Vogt n.d.).

Discussion

The various proposals of culture-complexes and techno-complexes offer still vague frameworks with which to conceptualise relations between prehistoric communities in Yemen and surrounding groups. The frameworks remain vague precisely because the evidence is so thin, the stylistic and formal similarities so general. Even so, the frameworks offer mechanisms by which to account for the character of the observations from which they arise: different combinations of common culture-historical origin, of functional constraint, of exchange and other forms of interaction.

The pastoralist nature of that proposed techno-complex seems assured, but its workings (and even the chronology of many of its components) remain less than clear and it does not directly address developments in highland and coastal Yemen. Moreover, the aceramic character of Bronze Age groups in Hadramawt, Mahra, Dhofar, and probably also Southwestern Saudi Arabia (Newton and Zarins 2000: 166 not withstanding) leave the techno-complex an unlikely mechanism for transmission of pottery from the southern Levant to highland Yemen.

In any event, ceramic links simultaneously with the Levant and Northeast Africa strain credulity—one (or both) of the connections probably is illusory. The broad family resemblance of decorative techniques and styles (Africa) versus possible formal convergence of similar function (Levant) in pottery, and the probable indications of the obsidian evidence (such as it is) favour the African over the Levantine connection. Moreover, the minimal evidence for highland-coastal interactions within Yemen, especially if coastal obsidian is granted African origins, leave the highlands in relative isolation from both vigorous economic exchange and effective cultural interaction with northeast African groups. Fattovich's developmental scheme must be regarded as overstated especially in this respect. Most local raw materials are widely available within the highlands so Bronze Age communities in no one area can readily control circulation of resources. Consumers in coastal and desert fringe communities most likely drew on resources available in adjacent uplands (rather than the highlands proper), and acquired through short-distance trade or by access to sources embedded in vertical transhumance, to complement goods acquired through coastwise and maritime trade. If the proportion of obsidian in chipped stone assemblages is taken as a rough indicator of volume of coastal trade, even the maritime trade remained at low levels until the mid-2nd millennium B.C.

The second half of the 2nd millennium was a period of radical change throughout Southwest Arabia: the material cultural hallmarks of the South Arabian civilization took root in the wadi systems of the desert fringe and in Hadramawt (in a ceramically different configuration) by *c.* 1200 B.C. (de Maigret and Robin 1989; Sedov 1996); Sabr emerged as an urban centre near Aden by 1400 B.C. while highland communities began a trend toward larger settlements and/or more a clustered settlement pattern (Vogt and Sedov 1998: 265; Wilkinson and Edens 1999: 5-7); flows of raw materials between regions within Yemen greatly increased in volume and probably also in organizational character (efficiency and reliability), now also accompanied by a little pottery. In accompaniment to these internal changes, identifiably African materials began hesitantly to appear in Southwest Arabian contexts, notably at Sabr. These developments mark the emergence of South Arabia as a civilization founded in equal measure on sophisticated agricultural schemes and on involvement in inter-regional trading systems, both overland and maritime. The evidence is not yet sufficiently developed to identify the causes of these late 2nd millennium developments, even on the question of immigration from northern Arabia (an interpretation favoured by many scholars of South Arabian origins) versus emergence from indigenous antecedents.

The Red Sea thus did not host a thriving maritime trade of the kind found in the Gulf until late in the Bronze Age. The reasons for this difference may be found in contrasting systemic interregional relationships in the two bodies of water. The Gulf provided a corridor between two great centres of economic production and consumption, Mesopotamia and the Indus, while communities along its southern shores facilitated exchange, consumed goods carried in the trade, and produced goods that entered the trade. Mesopotamia began its commercial relations with Gulf communities by the later 4th millennium (significantly earlier if the distribution of 'Ubaid sherds in the Gulf counts as commercial relations), but socio-economic development of Gulf communities linked to the trade did not blossom until after the Indus civilization coalesced and provided a firm anchor at the eastern end of the system.

In contrast, Egypt's southern commerce was far more oriented toward overland traffic, often through Nubian intermediaries like Kerma, even though Egyptian shipping did sometime reach distant lands such as Punt (perhaps eastern Sudan/northern Ethiopia, where archaeological evidence indicates interaction with Egypt) during the 2nd millennium B.C. The socio-economic effects on local communities of exchanges with Egypt were not profound, these groups remaining only somewhat socially complex. Lands along the eastern coast of the southern Red Sea could provide relatively little enticement to attract Egyptian commerce. And lastly, Egypt was the only potential centre of economic production and consumption by which firmly to anchor a Bronze Age trading system in the Red Sea. Egypt had numerous economic interests in other directions, thus reducing incentives to stabilize and routinize its economic relations with lands facing the southern Red Sea; the ready overland accessibility of southern goods from a wide economic catchment via Nubian intermediaries further diffused local impacts of trade.

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Ancient Maritime Trade in the Indian Ocean: Evaluation by Scientific Studies of Pottery

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Abstract

For the past ten years, the author has been successfully employing mineralogical analyses by XRD and microscopic methods for scientific comparisons of pottery related to maritime trade of the Indian Ocean. With these techniques, it was possible to establish firm interrelationships between Ras al-Junayz (Oman) and Lothal during Indus Civilization (Gogte 2000a) and Petra (Jordan) and India during the Early Historic period (Gogte 1999). Further, the study of the Rouletted Ware has helped in visualizing the dynamic trading activities of the people of Bengal on the east coast of India and Sri Lanka during the Early Historic period (Gogte 1997, 2000b and 2001). The paper reviews important features of the above studies to bring out the utility of the scientific studies in understanding ancient maritime activities.

Introduction

If we take stock of the archaeological studies undertaken in widely separated regions of Indian Ocean, it appears that a huge amount of literature is available on India, Arabia and East Africa. However, most of these studies have been done in isolation with mainly intra-regional considerations. For example, a large number of archaeological excavations have been carried out in India over the last fifty years but due to the lack of proper opportunities, little work could be done in actual physical comparisons of the Indian excavated materials with those from the regions across the Indian Ocean such as East Africa and Arabia. Indian archaeologists have had to rely mostly on the excavation/exploration reports for comparative studies. On the other hand, archaeologists working in the Mediterranean region and Arabia or on the coastal sites of Africa are either unaware of the contemporary excavated material from India or have not got enough opportunities to handle Indian artefacts.

Comparative studies based only on excavation reports, though useful in many cases, are essentially speculative in nature. In case of pottery, for example, the morphological features as presented in most of the excavation reports are insufficient to establish their complete identity. Other important characteristics such as colour, treatment of slip, clay matrix and mineral inclusions should be used for proper comparisons. However, they can be studied only by actual side by side handling of the pottery from different regions. Further, whenever possible, scientific studies should be undertaken to firmly establish the results of these comparisons (Gogte 1995 to 2001). Such exercises are absolutely important in understanding ancient maritime activities of the Indian Ocean.

Ras al-Junayz (Oman): an Indus Settlement of Lothal

Ras al-Junayz, a coastal site on the east coast of Oman, was brought on the world archaeological map in 1981 with an accidental discovery of a potsherd with incised script of the Indus Civilization. The archaeological remains were found on the sandy embayment of the site which is about 11 km south of Ras al-Hadd, the coastal corner point of Oman. A series of excavations at the site conducted by a Joint French-Italian Mission brought to light several stages of occupation starting from *c.* 2300 B.C. (Cleuziou and Tosi 1986, 1988 and 1989).

The excavated material from this site and that collected from a wider area close to the site included all kinds of manufactured goods from the Indus Civilization. There were fragments of pottery jars, alabaster vases, copper and steatite seals and metal objects. The most remarkable find was a carved ivory comb with a motif of double circles identical with that found at many Indus Civilization sites. The occurrence of the material from the Indus Civilization at Ras al-Junayz was, however, not very surprising as the appearance of the Indus materials, or materials in the Indus style or of Indus derivation have been reported in Gulf contexts since the fifties on Bahrain, Failaka and the adjacent Saudi littoral that defined the Dilmun culture

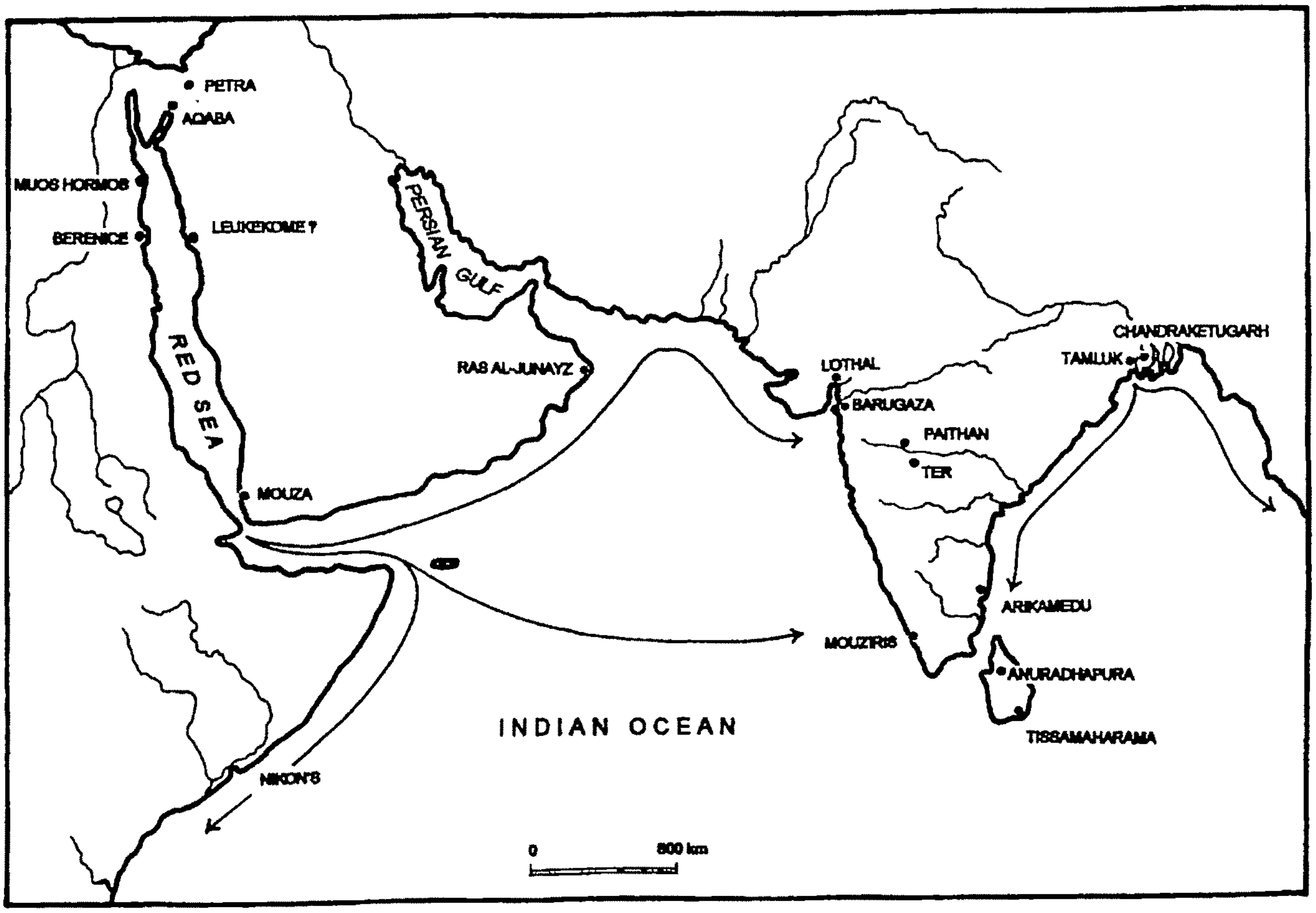

Fig. 1: Major sea-routes and some of the ancient sites mentioned in *the Periplus of Erythraen Sea* in the context of maritime trade during the first century A.D. (Gogte 1999)

(Edens 1993: 335). Excellent reviews have been written on this subject by many authors such as Edens (1993), Tosi (1993) and Chakrabarti (1990).

The occurrence of the Indus pottery at Ras al-Junayz posed many questions. Whether the settlement was of the local people of Oman or was it established by the Indus people? What kind of interaction Ras al-Junayz had with the Indus Civilisation? Whether the Indus pottery was produced locally in Oman or was it brought from outside? To address these questions, scientific study of the pottery from Ras al-Junayz was undertaken. Such a study involves analysis of pottery and the related materials such as clays, either by chemical methods or mineralogical techniques. In the present study, X Ray Diffraction (XRD) method has been used for mineralogical comparison of pottery and clays from Ras al-Junayz with those from a number of sites in Oman and India (Gogte 2000a).

Mineralogical comparison of the pottery with the clays from Ras al-Junayz and other areas of Oman revealed that only 12% pottery from Ras al-Junayz shows some affinity with the clays from the Bronze Age site at Baat, a Bronze Age settlement in Oman.

The remaining 88 % pottery from Ras al-Junayz did not compare with any of the clays collected from different parts of Oman as far as Baat. Therefore, it must have been brought to this site from a region outside Oman. As the pottery showed resemblance with the Indus pottery, the mineral patterns of the pottery from Ras al-Junayz were compared, in the first trial tests, with those of the pottery from the well-known Indus and the Late Harappan sites in India.

In this comparison, the pottery from Lothal showed greatest affinity with that of Ras al-Junayz. It was, therefore, decided to focus on Lothal for detailed XRD analysis of all types of pottery, clays, fired clay lumps of archaeological context and typical Indus bricks found at this site.

Comparison of the XRD patterns of the pottery from Ras al-Junayz and Lothal have produced dramatic results.

Out of 76 potsherds from Ras al-Junayz 67 potsherds matched very closely with the pottery from Lothal. The Red Ware from Ras al-Junayz is mineralogically identical with the Red Ware from Lothal. The Cream Ware from both sites is exactly matching (Fig. 2). The mineralogical study has, thus, clearly established import of this pottery from Lothal. Excepting the decorated variety, the pottery itself could not have been the item of trade. Most of it must have been brought either for storing the trade items or simply for the daily requirements of the traders.

A comparison of the published excavated materials (Table 1) from Ras al-Junayz with those from Lothal further lends support to the strong relationship between these sites. The most striking is the Indus painted jar found at Ras al-Junayz (Cleuziou and Tosi 1988: 45). The vase is high-necked medium sized jar having a complex decoration combining geometrical vegetal and zoomorphic patterns. The ochre coloured sandy and porous slip is similar to the Cream Ware fabric. The shape and decoration have without any doubt Indus character. It is entirely covered with black painted patterns on a red cover applied on smoothened external wall. Two main registers are separated by a frieze of suns in oval, a common Indus motif. Other typical Indus motifs are: a feathered tree, a palm tree, series of horizontal cross-hatched scales and birds. This jar compares well in shape and decoration with two jars from Lothal (Rao 1873: fig. 23).

On the other hand, a Persian Gulf steatite seal found at Lothal gives evidence of Indo- Arabian exchange of goods. The Lothal seal closely resembles the circular stamp seals of steatite found in the excavations at Barbar and Ras al-Qala in the island of Bahrain, where they originated and were used by merchants who traded with the Indus and Sumerian ports. Some of the late circular seals from Failaka are identical in all details with the seal found at Lothal (Rao 1985: 313).

Further, the appearance of a bun-shaped copper ingot and arsenic-free copper objects of high nickel content at Lothal have been assigned as imports from Oman (Rao 1973: 80 and 1985: 524). The study of the bun-shaped ingots by the Deutsches Bergbau Museum at Maysar in Oman (Hauptmann 1985) has revealed that such ingots are certainly characteristic of third millennium copper production in Oman.

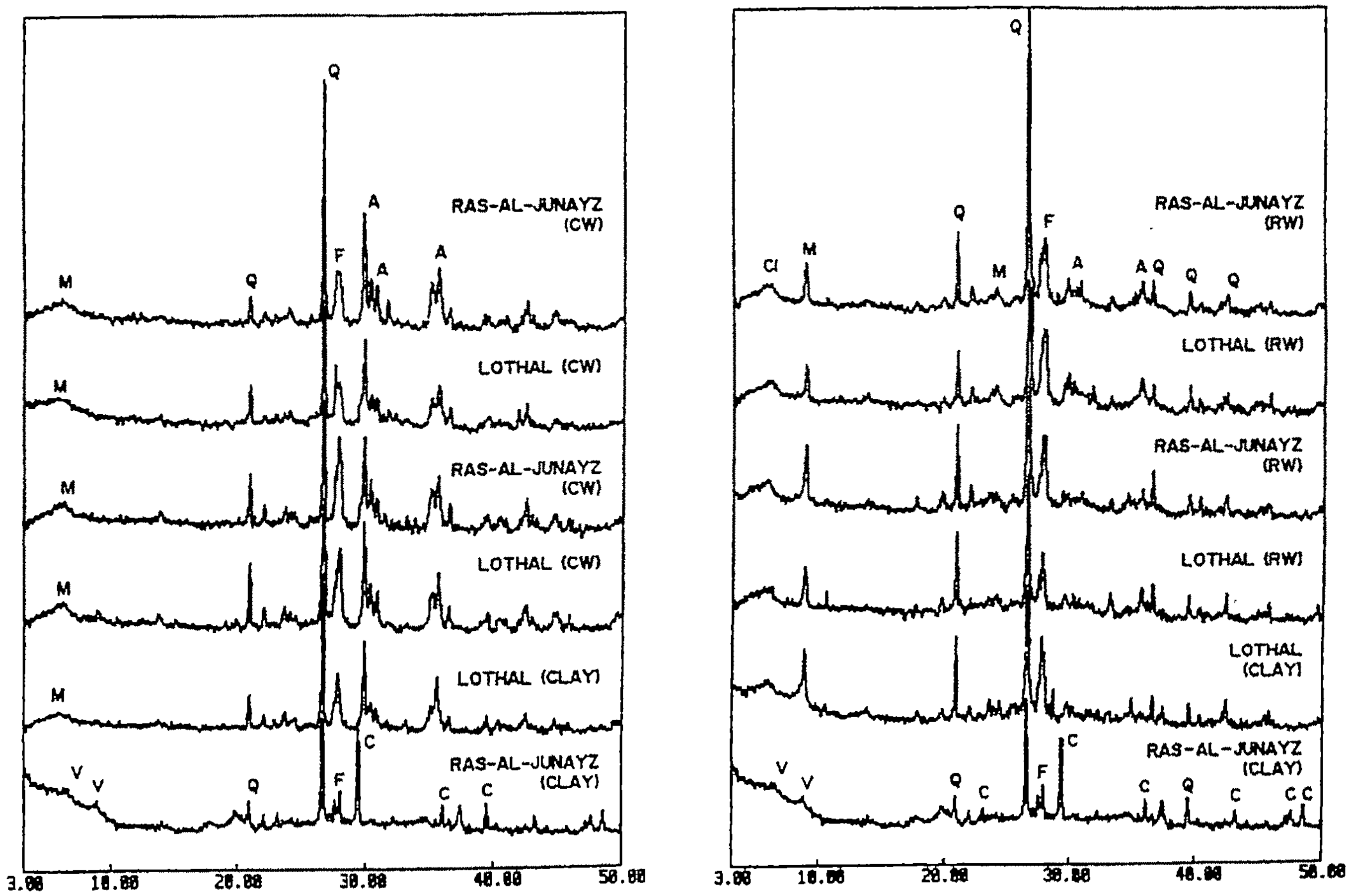

Fig. 2: XRD patterns of the Red Ware from Ras al-Junayz compare with those of Lothal. They, also, compare well with the clays from Lothal. As against this, both wares are mineralogically totally different from the local clays at Ras al-Junayz (Gogte 2000a) (Cl = chlorite, M = muscovite, Q = quartz, F = felspar, A = augite, V = vermiculite and C = calcite)

Table 1: Identical archaeological materials found at Ras al-Junayz and Lothal (based on excavation reports)

		Ras al-Junayz (Cleuziou and Tosi)	**Lothal (Rao 1985.)**
1	Copper Stamp-seal	Fig. 18 (1)-(1988)	Pl. CLIV-C
2	Copper Stamp-seal	Fig. 18 (2)-(1988)	Pl. CLXII-A2
3	Copper Rings	Fig. 18 (3-5)-(1988)	Pl. CCXLII(4-6), Fig. 115
4	Copper Tool	Fig. 18 (6)- (1988)	Fig. 110 (3)
5	Copper Bi-point	Fig. 20 (3,4)- (1988)	Fig. 111(8,11)
6	Painted Jar	Fig. 35-(1988)	Fig. 41-42
7	Bone Tool	Fig. 21 (2)-(1988)	Pl. CCXCII(14), Fig. 139 (1)
8	Stone Bowl	Fig. 18-(1986)	Fig. 125(13)
9	Steatite Stamp-seal	Fig. 23-(1986)	Pl. CLIII-C
10	Stamp-seal Motif	Fig. 21 (2)-(1986)	Fig. 138 (4, 5)
11	Double Circle Motif	Fig. 22-(1986)	Pl. CLXI (D)

It is pertinent to mention here that Lothal is the only Indus site where a large well-built dock with an adjacent warehouse has been found. The study of sediments contained in the basin revealed well-preserved assemblage of marine organisms e.g. *foraminifera* which indicates marginal marine environment (Nigam 1988: 20-21). A number of stone anchors have been recovered from the bottom of the dock. There are about 230 Indus Civilization sites in Gujarat close to Lothal (Misra 1994: 512). The Indus people from this area and those from the northern region must have used the big dock with warehouse facilities at Lothal for undertaking maritime trade with Arabia.

There is an equal possibility that the people at Lothal had interacted with other places in Arabia, such as, Failaka, Tarut, Dhahran, Abqaiq and Hofuf (Saudi Arabia), 'Ali (Bahrain), Umm An-Nar, Tell Abraq, Shimal, Hili, Baat, Ras al-Hamra and Ras al-Hadd (southeast Arabia) where Indus materials have been found. For example, a micaceous orange-red jar decorated with black painted bands from Shimal has been compared with pottery from Lothal and a nearby site at Rangapur (de Cardi 1988: 46). The following conclusions emerge from this study:

1. Scientific analysis showing mineralogical equivalence of the pottery at Ras al-Junayz and Lothal. The occurrence of other identical materials at these sites and the near absence of the local pottery at Ras al-Junayz lead to the conclusion that the site was a settlement of the Indus people from Lothal.
2. In view of the small size of the settlement at Ras al-Junayz and because of the paucity of archaeological materials at this site, it is most likely that this coastal site could have been used as a transit point for loading and unloading of trade items by the people from Lothal. They were probably coming to Oman either for trade with the local people of Oman or simply for exploration and replenishment of some material, such as copper, from the interior parts of Oman.
3. The occurrence of the Gulf seal at Lothal suggests that the Arabian shipmasters could have used the warehouse facilities at this dock site for procurement of trade items such as ivory, cloth, steatite, carnelian and other minerals which were available, in plenty, in the region close to Lothal. From the appearance of a bun-shaped copper ingot and arsenic-free copper objects of high nickel content at Lothal resembling the third millennium copper ingots in Oman, it is probable that the Arabian shipmasters could have exchanged copper for the above mentioned items at Lothal.

Maritime Trade between Petra (Jordan) and Early Historic Western India

One of the oldest and authentic references to the Nabataean capital, Petra, occurs in the Periplus of Erythraean Sea (Fig. 1). It is in Chapter 19 of the *Periplus:* "on the left from Berenike, two or three days run from Muos Hormos eastwards, crossing the gulf which lies alongside, there is another harbour with a fort, called Leuke Kome from which there is [a route inland] to Petra, to Malikhas king of the Nabataioi. It has some reputation for the ships, though [they are] not large ones, [which come] loaded from Arabia. For this reason a collector of a tax of a quarter on imported merchandise is posted there, and for security a centurion with a garrison." (Huntingford 1980: 31).

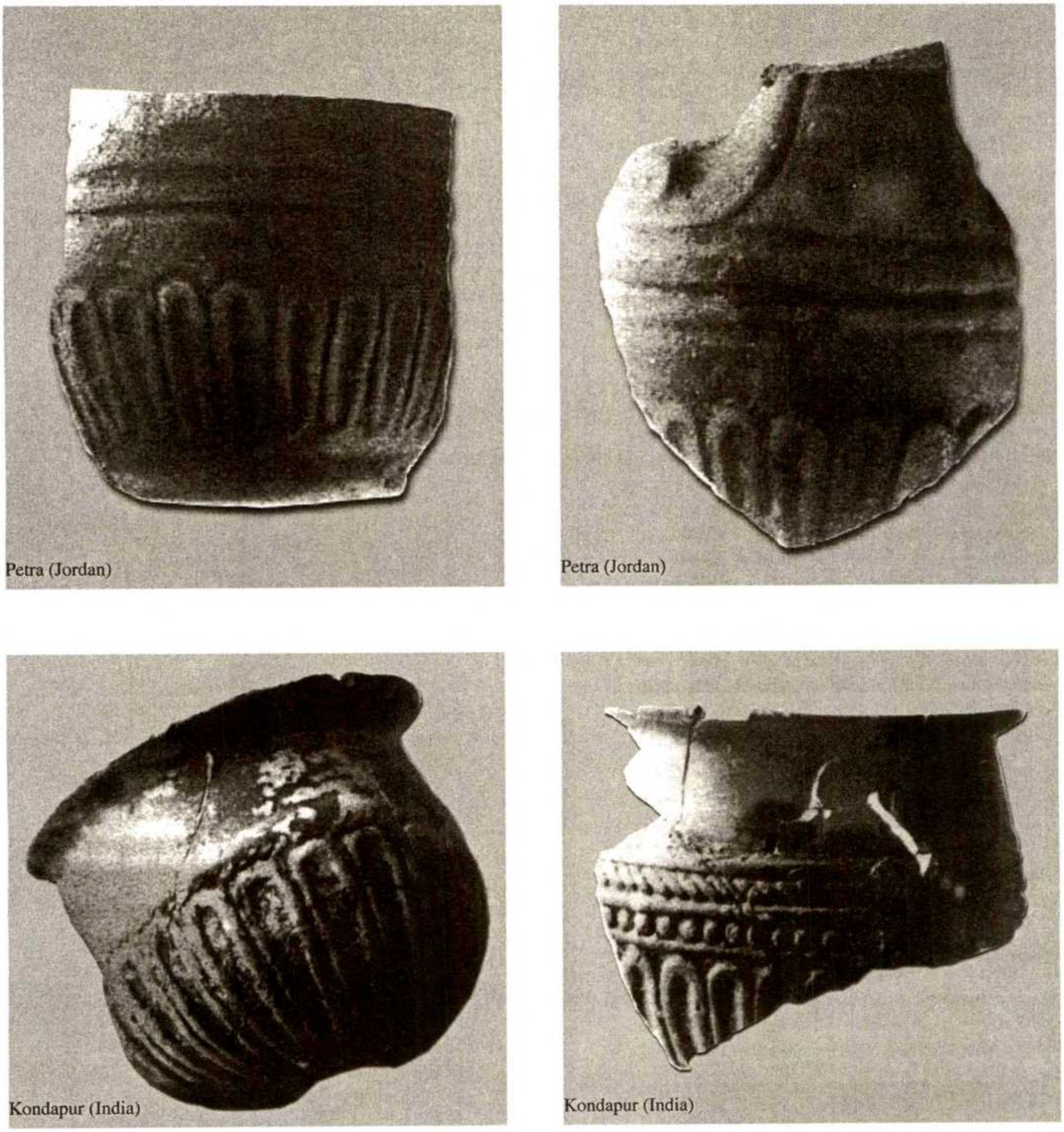

Fig. 3: The MW from Petra is identical in all respects, particularly in the production technique and the scheme of floral relief decoration, with that found in Western India at Kondapur, Ter, Nevasa and Kolhapur (Gogte 1999)

This is followed by a detailed account of the Arabian coast and then Mouza (a coastal site in Yemen). "After these [regions], in the furthest bay on the left hand of this sea is Mouza, an established mart beside the sea, distant from Berenike, for those sailing south, at least 12,000 steads. The whole place is full of Arabs, shipmasters and sailors, and hums with business; for they use their own ships for commerce with the opposite coast and with Barygaza (modern Bharuch on the west coast of India)."

As we know today, the Nabataeans were dynamic Arabian traders who controlled the major trade routes between Arabia and Damascus at least during the B.C.-A.D. changeover. It is widely believed that they traded not only with the Mediterranean countries but also with India, China and the Far East (Bienkowski 1996: 17). Although, frankincense was their major trade item, they also handled materials such as animals, spices, iron, copper, gold, fabrics, sugar, medicines and ivory. The Periplus, mainly in chapter 6 and elsewhere, gives a list of items imported from India by ports on the Red Sea. The items are iron, steel, the broader Indian cloth called monakhe, cloth called segmatogenai, belts, garments called gaunakai, mallow cloth, muslin, coloured lac and sugar. As the trader's handbook contains an unmistakable reference to Petra as the capital of Malikhas king of the Nabataeans, it may be safely assumed that some of the above mentioned trade items coming from India were traded by the Nabataeans. Although, we understand from the Periplus that Arabs, Greeks and Indians participated in the Oceanic trade to and from India, it is difficult to know if the Nabataeans actually took part in the voyages across the Arabian Sea.

In spite of the references in the Periplus, no serious attempt has been made in the archaeological context to evaluate the trade of the Nabataeans with India. Considering the perishable nature of the trade items imported from India, the study of pottery appears to be a logical step in this direction. Sherds of the Red Polished Ware (RPW) have been found at Sohar, a coastal site in Oman (Monique Kervran, personal communication). Mineralogical analysis of these sherds conducted by the author showed that the RPW was not mineralogically matching with the local clays or pottery from Oman but they were indeed identical with the those from the sites in a region in western India which has been identified as Ariake in the Periplus. The RPW is a fine pottery with uniform texture similar to the Nabataean fine red pottery. It is, therefore, likely that some of the RPW sherds found on the Nabataean sites could have been mistaken for the local pottery. Occurrence of this ware on these sites in Jordan would confirm the Nabataean trade with Barygaza, in particular, and Western India in general.

A comparative study of pottery by the author has produced, perhaps, the first material evidence of the interaction between the Nabataean and the contemporary Indian sites (Gogte 1999). It comes from the occurrence of identical pottery known as the Mould Ware (MW) at Petra (Schmitt-Korte 1984: 40) and on several Early Historic sites (100 B.C.-200 A.D.) in western India, namely, Ter (Chapekar 1969; Deshpande 1969), Kondapur (Ahmad 1950; Begley 1991), Nevasa (Sankalia *et al.* 1960) and Kolhapur (Gorakshikar 1975). The MW is small in size, ranging from 4 to 6.5 cm and produced from two vertical molds joined together. The vertical joint is clearly visible running from rim to bottom. The most common motif is long petals radiating from the bottom on the lower body of the MW. Other motifs consist of beads, ovals, bead and reel and rosettes which appear between ridges on the upper body.

The MW from Petra as illustrated by Schmitt-Korte (1984:40) is different from the Late Hellenistic Samarian moulded ware usually found in that region, for example, at Samaria-Sebaste (Hennessy 1970: 11).

On the other hand, the MW from Petra is identical in all respects, particularly in the production technique and the scheme of floral relief decoration, with that found in Western India (Fig. 3). It is, however, rare in Petra. This contrasts with its occurrence in good quantity in Western India, particularly, at Ter and Kondapur. These sites are considered as the centres of production of the MW.

These sites, along with Nasik, Nevasa, Paithana and Kolhapur were interconnected by inland trade routes starting from Bharuch (Barygaza of the Periplus) on the west coast of India. Excavations at these sites have given ample evidence of contacts with the Roman World in the form of the Mediterranean amphorae, Roman glass and bronzes. The reference to Ter (Tagara of the Periplus) occurs in Chapter 51 of the Periplus in the context of maritime trade. All sorts of muslins and common cloth went from Ter to the harbours and marts on the coasts of the Red Sea. It is, therefore, probable that the MW produced at Ter and Kondapur could have reached Petra along with other trade items.

A reddish pottery found at the coastal site at Alagankulam in South India was classified as the Late African red slipped ware, its probable place of origin being Tunisia (Nagaswamy 1991: 252). Mineralogical analysis of this pottery has, however, shown that the pottery was coming from the Ganga Plains of North India (Gogte 1997: 82). There is, therefore, a distinct possibility that the mineralogical analyses of some of the red slip wares occurring at the coastal site at Aqaba and classified as African pottery (Parker 1998: 388) could reveal their Indian origin.

It is, however, highly surprising that no reference to Aqaba appears in the Periplus but from the mounting archaeological evidence of the Nabataean settlement from the first century B.C. at this site (Parker 1998) and with the availability of an easy inland route from this site to Petra, there are now strong reasons to equate Aqaba with Lueke Kome of the Periplus. Diana Kirkbride (1990: 257) has placed Lueke Kome at Aqaba mainly on historical grounds. From the cursory description of the long Arabian coast of the Red Sea in the Periplus, it appears that the author of the handbook described Lueke Kome based on hearsay rather than on first hand knowledge. It is also possible that the author who was either a trader or a shipmaster could not visit this harbour as the trade in this part of the Red Sea was, most probably, operated and controlled by the Nabataeans. In any case, it is evident that this port site at Aqaba was important in the trade networks of the Indian Ocean.

A careful re-examination of the excavated pottery from major inland Nabataean sites of Jordan such as Petra, Wadi Rum, Khirbet edh- Dharih and the coastal site at Aqaba would be helpful in identifying the Indian contribution. An inspection of the excavated pottery from Khirbet edh –Dharih by the author, for example, has revealed a red pottery with indented triangular patterns closely similar to that of the Rouletted Ware (RW) from India. Mineralogical analyses of the pottery from above mentioned sites in comparison with the corresponding pottery from the coastal sites in India would open a new vista in the archaeological study of this region.

Alternatively, it will also be interesting to search for the Arabian pottery on the ancient sites on the coasts of India. More attention has so far been given to easily identifiable Mediterranean Amphorae and Arretine Ware. Also, it is quite probable that some sherds of the fine red unpainted Nabataean pottery occurring on Indian sites could have been mistaken for the RPW of western India.

Early Historic Trade Empire of Bengal as evident from the study of the Rouletted Ware

The Rouletted Ware (RW) is one of the most distinguished wares of the Early Historic period. The RW occurs at numerous sites: on the eastern coast of India from Tamluk and Chandraketugarh in the delta of the Ganga to Alagankulam in the delta of the Vaigai river, inland in the valleys of the Krishna and the Godavari rivers (the most distant site being Nasik); in Sri Lanka at the coastal sites of Mantai, Kantarodai, Tissamaharama and Ambalantota and the inland site of Anuradhapura. RW has also been reported in Beikthano in Burma, at Kobak Kendal and Sembiran in Indonesia and at Tra Kieu in Vietnam. RW has been found in the Maldives and East Africa and at the Ptolemaic-Roman port of Berenike near the Red Sea.

The widespread presence of RW in India and Southeast Asia has raised several questions about its origin and sources. Did it originate at a particular place or region and spread to various places through trade and/or religious contacts or was it produced at multiple production centres in different regions? Wheeler (1946) treated RW as an import from the Roman world probably because the rouletting is similar to that on a wide variety of classical wares dating from the 4th century B.C. to Imperial Roman times and also there was no precedent for this type of decoration in India. Vimala Begley (1991), however, believes that RW is a regional product of South India in spite of strong scientific evidence against this speculation.

Mineralogical analyses of RW and the related Fine Wares from a large number of sites by the author have now conclusively proved that the ware was produced in the region of Chandraketugarh and Tamluk of the lower Bengal (Gogte 1997, 2000b and 2001). In fact, the alluvial deposits of the lower Ganga Valley are mineralogically similar to those of the Chandraketugarh-Tamluk region but as the main RW yielding sites such as Chandraketugarh, Hadipur, Khana-Mihirer-Dhipi, Noongola, Itakhola, Tamluk, Tilda, Atghara, Boral, Harinarayanpur and Bahiri are in Bengal, this region as a whole can be treated as the epicentre of the production of RW.

A comparison of the dimensions of bricks used in South India in various periods clearly shows that the dimensions of bricks at Arikamedu were uncommon to that region. On the other hand, it is important to note that the dimensions of bricks (33.7 x 23.0 x 6.8 cm) of the early phase of habitation at Arikamedu match closely with those of the bricks from structures at Tamluk (Period III corresponding to RW) and Chandraketugarh (uncertain period). It is therefore most likely that the traders from the region of Chandraketugarh-Tamluk built their houses at Arikamedu by imitating the pattern of bricks that was in vogue in their homeland.

In the light of a) the occurrence at Arikamedu of different types of pottery from Chandraketugarh from the very beginning of the habitation to 200 A.D., b) the occurrence of wood probably from the Sunderbans and c) the matching brick dimensions at Arikamedu, Tamluk and Chandraketugarh, the author hypothesizes that the people from the region of Chandraketugarh-Tamluk had established a permanent port at Arikamedu sometime between 250 to 200 B.C. and continued to operate it at least up to 200 A.D., maybe for inland trade in South India.

The port at Arikamedu must have, eventually, become a popular trading centre which was conveniently used by Roman traders at the beginning of the Christian era. Significantly, Casson (1991), citing the Periplus Maris Erythraei, has concluded that "Indian, rather than Roman craft, handled the east coast's trade, that carried its goods from these ports, including imports from Roman Egypt that had been unloaded at them". He further suggests that Roman merchants transported both these imports as well as exports, in Indian ships at Arikamedu.

Chandraketugarh has been identified as the famous port of Ganges mentioned in the Periplus (Das Gupta 1960). Interestingly, an indirect reference to Chandraketugarh in relation to maritime trade with South India occurs in the *Satyanarayan Puja*, an ancient Sanskrit text handed down to us by way of oral tradition. This *puja* (a multi-purpose religious ceremony) is undertaken to invoke the deity, Narayan or Vishnu, the Preserver, (one of the Hindu Trinity of the Gods, Siva, Vishnu and Brahma), for the well-being of the performer of this ceremony. The mention of '*shaka*', the Hindu calendar indicates that the earliest date of the final formulation of the text could be 78 A.D. Further the place of its origin could be at Narasapatnam in Andhra Pradesh on the east coast of India as it clearly mentions the region south of the Godavari delta. Narasapatnam could be interpreted as the place of dwelling of Narsimha, one of the ten incarnations of Vishnu. Again, the requirement of waters of the river, the ocean and those coming from mountain streams for performing this propitiation further, suggest a place of origin akin to that of Narasapatnam.

The text is followed by five *kathas* or fables based on the experiences of "merchants of that period travelling in boats". What is important in the context of the present study is the third story which mentions that "one merchant was arrested by King Chandraketu" of Ratnapur city situated on the bank of a river. If we look at some of the place names in southern Bengal, we have Chandraketugarh, Chandrakona, Chandernagore, Narayangarh, Harinarayanpur, Bishnupur, Vishnupur, Kesabpur, Lakshmipasa and Krishnagar as well as the rivers Rupanarayan and Damodar. These all are related either to King Chandraketu or to Vishnu since the latter was the most popular deity of that region in Bengal. Even today, the *Satyanarayan puja* is frequently performed in Bengal. Most probably, its authors were recounting stories of earlier times as told by their forefathers prior to sailing from Bengal to the port of Narasapatnam in Andhra Pradesh. It is pertinent to mention here that Beikthano, the name of a site in Burma where the RW occurs, translates to Vishnu in Burmese. According to Tilman Frasch (personal communication), the transformation is from Vishnu to Bisnu to Bisno to Beikthano as the consonant 's' is pronounced as 'th' in the Burmese language.

However, the best evidence of Chandraketugarh's participation in ancient maritime trade comes from a seal discovered at Chandraketugarh depicting "a horse in a ship". Other major commodities shipped from Chandraketugarh were textiles, food grains, spices and precious stones (Chakraborti 1992; Mukherjee 1993-94; Datta 1996). In relation to the shipment of horses, there is also a mention in *Pattinappalai*, the early Tamil text, of "the import of horses from across the seas at Kaveripattinam port", but the place of origin whence the horses were shipped is not mentioned (Raman 1991). If we put together the literary evidence about the import of horses at Kaveripattinam, a RW site and the discovery of the seal at Chandraketugarh, a likely pattern of ancient maritime trade emerges indicating that horses, brought probably from the northwest of India, were shipped from Chandraketugarh to various ports on the east coast of India for inland destinations in south India and Sri Lanka.

It is most likely that the horse traders might have had close contacts with contemporary horse riding people of the Megalithic culture of south India. Excavations of several Megalithic burials in south India have yielded horse bones, horse-furniture, the RW and the other pottery types which look identical to those from Arikamedu and Chandraketugarh. The Megalithic people had achieved an excellence in the production of iron (Gogte 1982) and they were the main producers of iron in south India. They might have procured horses and the RW from the horse traders in exchange of various implements and weapons of iron.

Horse traders must have become very aggressive and powerful community as evidenced from the ousting of the ruling king Suratissa (c. 210 B.C.) of Anuradhapura, Sri Lanka by two horse traders, Sena and Guttaka, from South India. They ruled jointly for 22 years (Seneviratna 1994). They have been described as *vanija* (traders) and *navika* (ship captains) who were engaged in the horse trade. Their names are alien to the Dravidian languages. On the other hand, it is interesting to note that the names of both Sena (Sen) and Guttaka (Gupta), are common suffixes in Bengal.

The implications of this observation are profound. The traders from Bengal were not an ordinary lot. They must have been extremely prosperous, dynamic and organized people. These 'trader-kings' must have maintained an army, established ports at several places such as Arikamedu and Kaveripattinam on east coast of India between 250 and 200 B.C. and continued to operate them at least up to 200 A.D. Thus they controlled maritime trade from Bengal to Sri Lanka. They also ruled a sizeable region of South India during the Early Historic period. Trade in this instance could be described as a 'State-owned' enterprise.

Further, one finds profuse evidence of Early Historic maritime trade between India and Southeast Asia (Glover 1990; Ray 1989; Basa 1994-95). Ardika and Bellwood (1991) have described an exciting discovery at Sembiran (Bali) of a dish-like vessel inscribed on its inner surface with three characters of Kharoshti script. The script was used in India from the Mauryan period onwards up to the 4th century A.D. Mukherjee (1989-90) found Kharoshti and Brahmi characters on several seals discovered at several sites in West Bengal in the vicinity of Chandraketugarh and Tamluk. From the presence of RW at Beikthano in Burma (Aung Thaw 1968; Aung Thwin

1987), and RW recovered from Kobak Kendal and Cibutak in Java (Walker and Santoso 1977a, 1977b), it may be inferred that the traders from Chandraketugarh, while mainly operating on the east coast of India, were also taking a sea route from Bengal to Burma and to Malaysia. Thereafter one route went to Indonesia (Java and Bali) and another to Tra Kieu in Vietnam via the coasts of Thailand and Kampuchea.

Conclusion

In the studies of ancient maritime trade of the Indian Ocean, more emphasis should be given to the scientific examination of archaeological materials to get a cohesive picture of exchange dynamics of cultures across the Indian Ocean. Considering the perishable nature of the most of the trade items, the study of pottery appears to be a logical step in this direction though pottery itself was rarely an item of trade. Such examinations of the excavated material from major coastal and inland sites along the Indian Ocean rim would not only be helpful in identifying the Indian contribution to creation of exchange networks, but also for getting a proper perspective of cross-cultural influences, exchange of technologies and migration/ settlement of peoples across the Indian Ocean.

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Mandvi: an Early Historic Sea Port near the Gulf of Kachchh, Western India

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Abstract

Mandvi, is the largest Early Historic site in Kachchh. Also, it is the only Early Historic site located on the coast of Kachchh. Interestingly, the site does not seem to be mentioned in any Greco-Roman or Indian texts dated between in the 1st c. B.C.-4th *c.* A.D. In particular, the *Periplus Maris Erythraei* (1st century A.D.) and the *Geograhia* of Ptolemy (2nd century A.D.), the two texts which provide copious information on Indian trade ports and coastal settlements, are silent about Mandvi. The occurrence of trade potteries at the site, especially Mediterranean amphorae, creates the case for an archaeological definition of the role of Mandvi as an ancient port.

History of Research

The modern town of Mandvi has long been known as a commercial port having enduring connections, mainly with the Omani and East African coasts. The earliest work done on Mandvi as an archaeological and historical site is by Postans (1839: 17). She has referred to the site as Raipoor. She found many coins but these were unrecognizable after so many years in the soil. Campbell (1880: 238-241) has described Mandvi and the nature of its coastline at length. Thakkar (1877: 32) has also mentioned it in his study of historical toponyms. Nanavati (IAR 1961-62: 10) has associated ancient Mandvi with the archaeological deposits at Nani Rayan about two kilometres north of modern Mandvi. The site is listed as Moti Rayan in the *Encyclopaedia of Indian Archaeology* (Ghosh 1989: 293). Dr. K.K. Bhan (M.S. University of Baroda) explored the site of Nani Rayan in the early nineties and found fragments of Mediterranean amphorae (personal communication).

Description

The archaeological site of Nani Rayan, located north of Mandvi, lies on the estuary of the Rukmavati River, and at the entrance of the Gulf of Kachchh (Fig. 1). The location of Nani Rayan suggests that it was an Early Historic port. We assume that Nani Rayan had a large population because the site measures roughly 1 x 0.5 km. The site is under cultivation and has been ploughed for many years. It seems to have had an agricultural base, important to sustain a large population and attractive to seafarers for food and other provisions.

According to the Periplus, the Gulf of Kachchh was a dangerous place to enter, ravaged by high tides and sharp reefs (Schoff 1912: 38). This is corroborated by modern day studies which shows that the Gulf experiences high tidal ranges (Nayak *et al.* 1989; Sahai 1992). However, the nature of the Arabian sea bed and that of the Gulf of Kachchh near Mandvi allows the port of Nani Rayan to be easily accessible. Though great volumes of silt are washed down by the Indus and deposited in the Arabian Sea and along the shores of the Gulf of Kachchh, the sea bed immediately south of Mandvi and the river Rukmavati has the lowest rate of silt deposition (Hashemi and Nair 1988:56-57; Gupta 1997). This makes the port easily accessible to ships. Campbell (1880: 238) has described a sand bank right at the entrance of the Rukmavati estuary and also the wind and the currents of the Arabian Sea and the Gulf of Kachchh which constantly change the features of the coastline. He has noted that ships anchor some kilometres away from the shore and smaller boats go to it to unload and load goods.

Mandvi being a port site is also indicated by the variety of coins found from around the site. These coins can be assigned to many historical periods: a punch marked coin; silver portrait coins of Nahapana and Chashtana; Gupta silver portrait coins with peacock on the reverse; base metal coins with an elephant on obverse and tree in railing on the reverse; similar coins with lion on the obverse and Ujjain symbol on the reverse. The last are typical local coins found in Kachchh and Saurashtra (personal communication, Dilip Rajgor). Other coins showed a fire alter on the obverse and a figure standing on

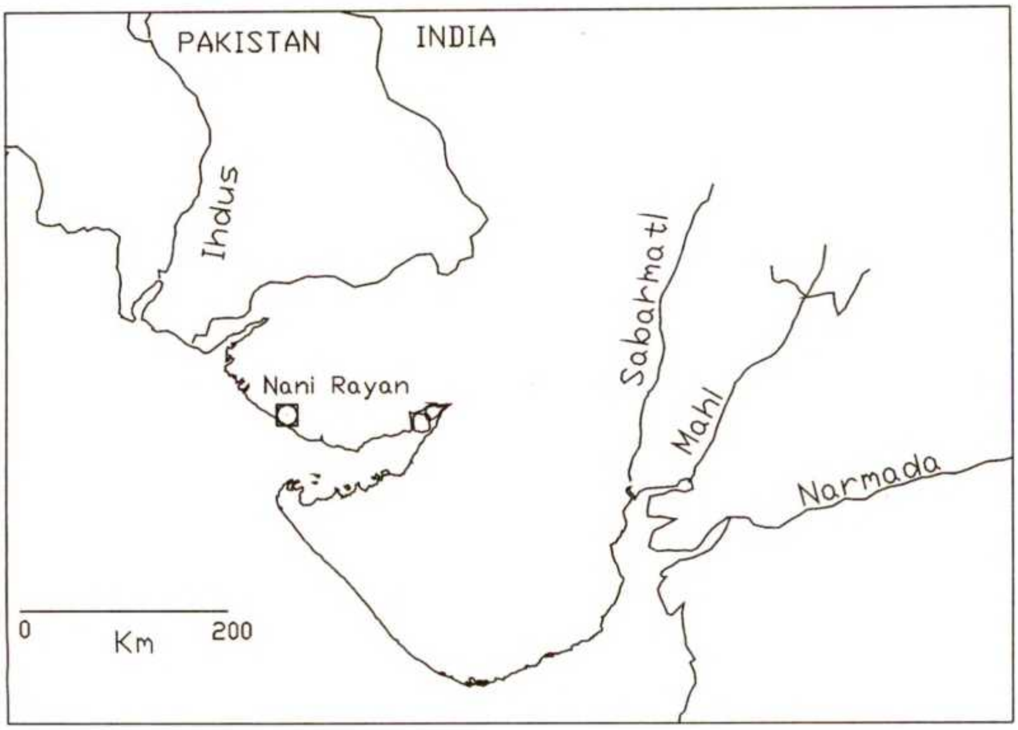

Fig. 1: Location of Nari Rayan

the reverse. Silver Kalachuri coins of the portrait type were also noted in the collection of Dr. Vasa in Mandvi (personal observation). A Byzantine Solidus of Heraclius dated to 638 A.D. and an Arab Umaiyayad Dinara Islamic gold coin dated to 716 A.D. from Mandvi published by Vasa (1990: 30-33) testifies to the long standing trading connections of the port. Coins of the Gadhaiya type were also found. These coins had a corrupt ass figure and are later in date but are an indication of trade. A lump of clay depicting some sort of a bird and another clay seal with the sign of the swastika were found. These last two artefacts are also in the possession of Dr. Vasa of Mandvi. A roller die was also recovered by Dr. Vasa (Fig. 2).

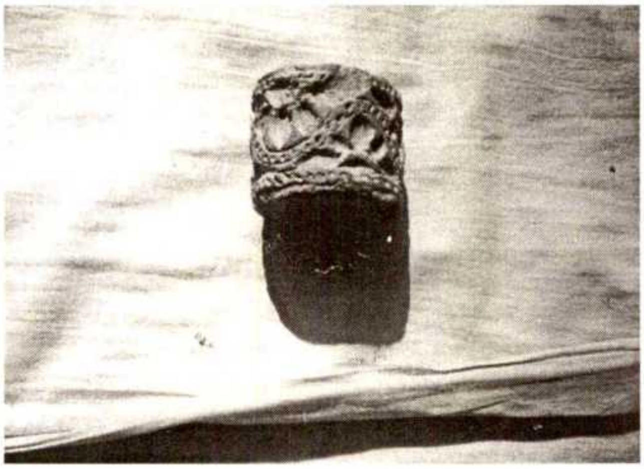

Fig. 2: A terracotta roller die

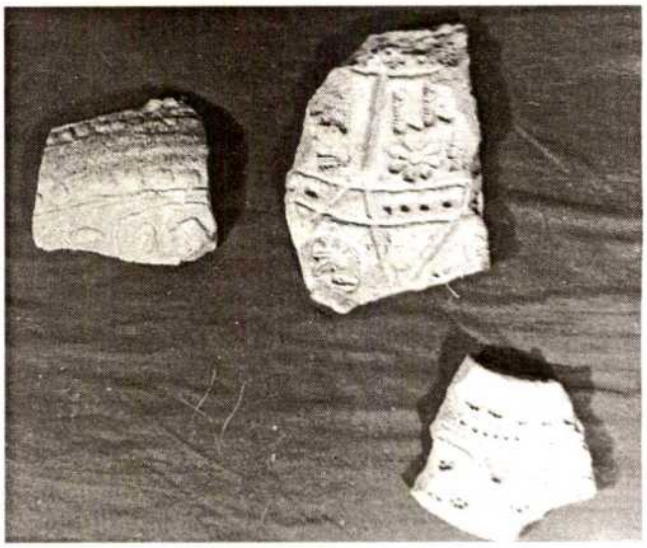

Fig. 3: Pottery mould and mould pottery

Different types of pottery were recovered from the site, including two fragments of pottery moulds. The moulds depict the fir tree motif, a bird and the usual flowers and foliage embellishments (Fig. 3). Similar

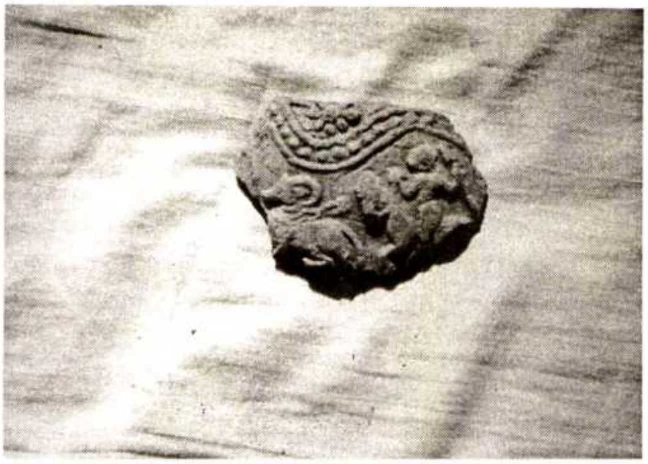

Fig. 4: Nani Rayan: A stamped ware pottery sherd depicting a man on horse back attempting to spear in animal

moulds were recovered from the Banbhore excavations on the mouth of the Indus river. Mould ware with human figures dancing etc, were also recovered and are in the possession of Dr. Vasa. A black ware stamped pottery sherd depicting two seated women playing some musical instrument, other stamped ware sherds depicted hunting scenes of men on horseback spearing lions (Fig. 4), a stamped pottery fragment depicting a fish (Fig. 3) and a red ware fragment showing incised designs were also recovered. Other stamped pottery fragments show only foliage designs. These fragments differ in fineness and quality of clay. This shows that they may have come from different sources. A red ware fragment shows a stamped wheel with spokes and on the inner side of the fragment a sort of a rouletted design can be. A pottery dabber was also recovered. As mentioned above, Bhan recovered amphorae sherds during his fieldwork at Mandvi (personal communication). A square seal with four vertical lines drawn on it was noticed. Small pots when broken revealed a sticky substance, which smelt like asafetida with a tinge of tamarind.

A grey ware recovered from Nani Rayan is of special interest because it has also been found from the Persian Gulf area and other parts of India. The grey ware is thin and decorated with incised designs and is in better condition than the other types of pottery recovered from Nani Rayan. Gupta (1997: 361-365) has subjected similar pottery from Ed Dur in the lower Gulf to thin section studies. This ware was also recovered from the port site of Qana in Yemen and from the island of Socotra in the Gulf of Aden. According to Salles (1993: 493-523) the grey ware (his Black Ware) represented 'Indian containers' that were used to carry essential commodities (wheat, rice, clarified butter) to west Asia/East Africa as mentioned in the Periplus (section 31). As this ware is found not only from both sides of the sea of Oman, but also from a number of sites in Saurashtra as well as from Mandvi, we can postulate that there was regular contact and interchange between India and the Gulf region in Early Historic times.

According to Mehta (1979: 210-211) navigational terms used by the sailors of Mandvi till recently indicate movements to the west, east and south from Kachchh and Saurashtra. The sea routes are named Bakhai Lal, Makarani Lal, Surati Lal and Malbari Lal. Lal is a derivative of nala meaning a route. Bakhai means Basra on the Persian Gulf; Makarani denotes the Makaran coast west of Karachi, Pakistan; and Malbari, the Malabar coast; Surati, present day Surat on the Tapti. This seems to corroborate the evidence of the Periplus about the connections of Kachchh and Saurashtra with the Arabs and the Romans of Egypt. According to Hornell (1918: 142) the Kotia (type of sailing ship) was the native craft of the coast of Kachchh and Kathiawar, making voyages from the Kachchi port of Mandvi to Mumbai, then to Madagascar or the East African coast and then back to Mumbai and Mandvi, Kachchh. It was built at Mandvi, Kachchh and along the Malabar coast.

Nani Rayan/Mandvi: An Indo-Roman Trading Station?

The site of Nani Rayan/Mandvi does not seem to be mentioned in the Periplus (Schoff 1912). The reason for Mandvi's absence in the Roman records may be rooted in political strifes of the period. According to Schoff (1912: 14) Kachchh was a Parthian domain and at the time of the Periplus (1st century A.D.) the Romans were at war with the Parthians. The coast of Kachchh may not have been described in detail in the Periplus because the anonymous author of the Periplus of the Erythraean Sea was a Roman subject albeit from the eastern part of the Roman empire. The rivalry between the Indo-Parthian rulers and the Western Kshatrapas of Gujarat may have also kept Mandvi in historical oblivion. According to Senior (1997: 17) Gondopharnes Sases, a descendent of Gondopharnes I restruck the coins of Nahapana the Western Kshatrapa ruler who ruled over Western India. Gondopharnes Sases ruled in the first quarter of the first *c.* A.D. and Nahapana may have ruled earlier than Gondopharnes Sases. Chashtana, the Kshatrapa who founded the Saka Era was the later contemporary of Nahapana. The silver portrait coins of the Western Kshatrapas are very similar in style and motif to the Parthians coins of Gondopharnes and Gondopharnes Sases. This has been brought in to explain why Nani Rayan has not been mentioned in ancient travel texts.

In any case, we can also explore the possibility that some settlement listed in the Periplus or Geographia may actually be Mandvi. In the Periplus (Schoff 1912: 24) there is an interesting reference to the town of Minnagara. According to Saletore (1993: 544-546), the ships that arrived from Egypt anchored at Barbaricum but all the cargoes were carried up to the metropolis of Minnagara by river to the King. From this it cannot be inferred that Barbaricum was "the market town of Minnagara" because all that the Periplus states is that foreign ships used to come and anchor there while the goods were conveyed up the river to the metropolis of Minnagara. That is why the Periplus states that "all the cargoes were carried to that town and from there much cotton cloth was brought down to Barygaza." If Barbaricum was indeed the market town of Minnagara then all this traffic to and fro would have been simply unnecessary and futile. There is yet another point to add to the importance of Nani Rayan. In the Aditta Jataka, mention is made of Roruva, the capital of the kingdoms of Sovira. This region came under the influence and control of the Scythians and their capital, the Roruva of Buddhist literature, came to be known as Minnagara. Its location is described in the Periplus (section 40) "Beyond the Gulf of Baraca (Gulf of Kachchh) is that of Barygaza and the coast of the country of Ariake which is the beginning of the kingdom of Nambanus and of all India. That part of it, lying inland and adjoining Scythia, is called Abhiria, but the coast is Surastrene... The Metropolis of this country is called Minnagara. Before it lies a small island and inland behind it is the Metropolis of Scythia, Minnagara" (Saletore 1993: 285, 544, 546). The mention of Roruva or Minnagara between the ports of Barbaricum on the Indus and Bharuch on the Narmada puts the focus on Nani Rayan as the likely point of Rovura/Minnagara. Nani Rayan/Mandvi is strategically situated at the entrance of the Gulf of Kachchh to enable it to be Roruva/ Minnagara.

Conclusion

In conclusion we can say that a large number of archaeological artefacts observed at Nani Rayan show a strong foreign influence and the presence of amphorae definitely points to trade connections with the Mediterranean region. Circumstanial evidence suggests that Nani Rayan/Mandvi was the ancient Rovura of the Jatakas or the metropolis of Minnagara mentioned in the Periplus of the Erythraean Sea.

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An Archaeological Reconnaissance of the Konkan Coast from Bharuch to Janjira

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Abstract

From the Narmada-Tapi estuarine zone, the Konkan coast stretches under the shadow of the Western Ghats to the river Sharavati in northern Karnataka. The metropolis of Mumbai is a convenient marker between the northern and western parts of the Konkan. The Konkan coast was a dynamic littoral region in historical times, impacted by urbanism from the interiors and attracting overseas trade in the B.C.-A.D. transition. The paper brings together results of fieldwork undertaken in the Konkan from 1993 to 2000 by the authors singly and jointly. We intend to establish the validity — in archaeological terms — of Early Historic ports mentioned in textual records. In particular, the focus is upon harbours of western India listed in the Greek texts such as the *Periplus Maris Erythraei* (1st century A.D.) and the *Geographia* of Ptolemy (2nd century A.D.). The results of our survey are set out from Bharuch (ancient harbour of Brgukaccha) to the anchorage of Kuda at the head of the creek at Murud-Janjira. New evidence of transport pottery and archaeological features of Early Historic port-sites is presented.

I. Introduction

In 1992, a coastal survey was initiated by Sunil Gupta (SG) in the Konkan for locating Early Historic ports mentioned in the Periplus and Geographia. The creeks of Chaul and Janjira in the southern Konkan and at the mound of Kamrej on the river Tapi north of Mumbai were explored (Gupta 1993: 119-127; 1994: 217-25; 1996: 52-58; 1997). The Konkan creeks of Chaul and Janjira were revisted by Vasant Shinde (VS) and SG in 1996. Meanwhile excavation of the site of Padri on the Saurashtra coast by VS between 1990-95 brought to light a rich Early Historic phase with evidence of Roman and Parthian trade artefacts (Shinde, Forthcoming). Dilip Rajgor (DR) conducted a study of coins and inscriptional data on the Konkan and undertook explorations around Bharuch and Elephanta (Rajgor 1998: 45-52). The authors decided to come together to pool field data and take up the field survey with the aim of reaching a deeper understanding of early harbours of the Konkan. The fieldwork was conducted in June 2000. Explorations were conducted at Bharuch city, along the banks of the Narmada, the Early Historic mound of Kamrej and Elephanta island near Mumbai (Figs. 1-2). The results of the survey by the authors (VS, SG, DR) are presented below together with an appendix presenting the preliminary identification by SG of imported amphorae at Elephanta.

Bharuch Area

The earliest reference to Bharuch or ancient Brgukaccha is to be found in the old Buddhist texts (Pitakas, Jatakas) originating in the mid-first millennium B.C. (Mehta 1939: 227-228; Sarao 1990:56). This port was known to the Hellenistic world as Barygaza. The Periplus Maris Erythraei (sections 43-49) and the Geographia of Ptolemy (Book 7, Chp. 1: 4-6) refer to the harbour by this name. Brgukaccha/Barygaza was a premier port of trade in the Indian Ocean exchange system. The Periplus mentions Barygaza's trade links with the Red Sea littoral (Periplus 26, 49), the Gulf of Aden (Periplus 57), the Persian Gulf (36, 49) and the Malabar coast (Periplus 56). In effect, we find that ancient Bharuch had direct interaction with all trade zones in the western Indian Ocean. It's connections with Sri Lanka and South-East Asia are alluded in the Mahajanaka Jataka (Mehta 1939:227). Brgukaccha/Barygaza was the terminus of major land routes from the Gangetic zone, Bactria-Gandhara and peninsular India (Periplus 48).

Modern Bharuch (Fig. 1) is situated directly on the ancient occupational deposits. Excavations were conducted at Bharuch by K.V. Soundara Rajan of the Archaeological Surve of India (*IAR* 1959-60: 19). The Black and Red Ware occured in Period I deposits, the phase anterior to Period II which yielded the Red Polished Ware. The deposits at

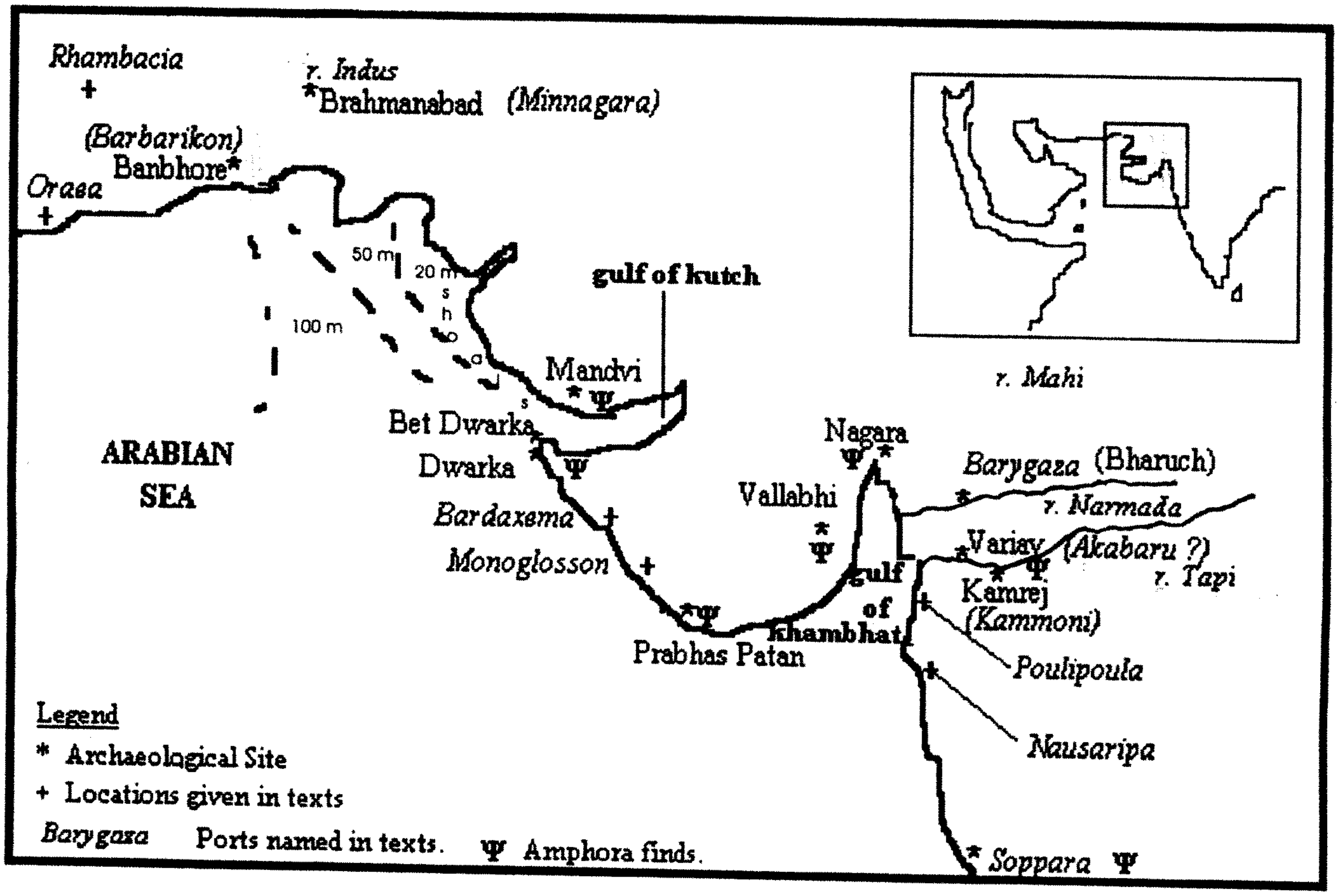


Fig. 1: Early Historic port-sites in Gujarat

Bharuch and its vicinity were prospected by a team from the Society of South Asian Studies, Cambridge in the early nineties The team reported deposits within the city and along the river Narmada (Howell 1994: 189-99).

The present authors explored the town area, stretches of the Narmada's banks downstream of Bharuch and also surveyed the mouth of the river Narmada. The view of the town from the banks of the river Narmada shows an undulating skyline, indicating old foundations. Within the inhabited township, the habitation deposits can be seen in several places. Mounds appear at a number of areas of Bharuch city showing that modern built up areas overlie the ancient city of Bharuch. At a number of places in the city, especially within the Bharuch fort facing the river Narmada, the medieval deposits are quite high. A prominent Early Historic mound formation was observed about a kilometer from Panchayat Office Guest House in the middle of the city (Fig. 3). The mound is approximately 10 metres high, with 5m of occupational deposit. It is about 100 x 100 metres in extent and situated about a kilometre from the Narmada river. Because of the cuttings on the mound made by the local inhabitants seeking earth, the stratigraphic profile of the site is quite clear. Ceramic types observed comprise Kushan period bowls, Red Polished Ware sherds and the Coarse Red Ware. A thick well-fired fragment of jar, possibly a Mediterranean amphora, was also recovered. Fired bricks were observed in the exposed sections, with floor levels of broken potsherds and storage jars. The bricks are large and possibly dated to 2nd-1st century B.C. The exposed stratigraphy indicates occupation from 2nd century B.C. to 2nd century A.D.

Early Historic pottery scatter on mud sections along the right bank of the river Narmada was observed some 3 kilometres downstream from main Bharuch city at a place called Bava Chaman. Atop a 5 m mud bank, the pottery scatter extended 120 x 80 metres. The pottery mainly comprised of a grey ware with painted lines and seems to be an early Iron Age pottery having affinity with the well-known Painted Grey Ware of northern India (Fig. 4). Interestingly, two rammed mud features, rising some 3 m above the mud-banks were observed close to the pottery scatter. These formations seem to be caused by human activity and may be eroded remains of wharfs on the river. The Periplus mentions 'deep spots along the river upto

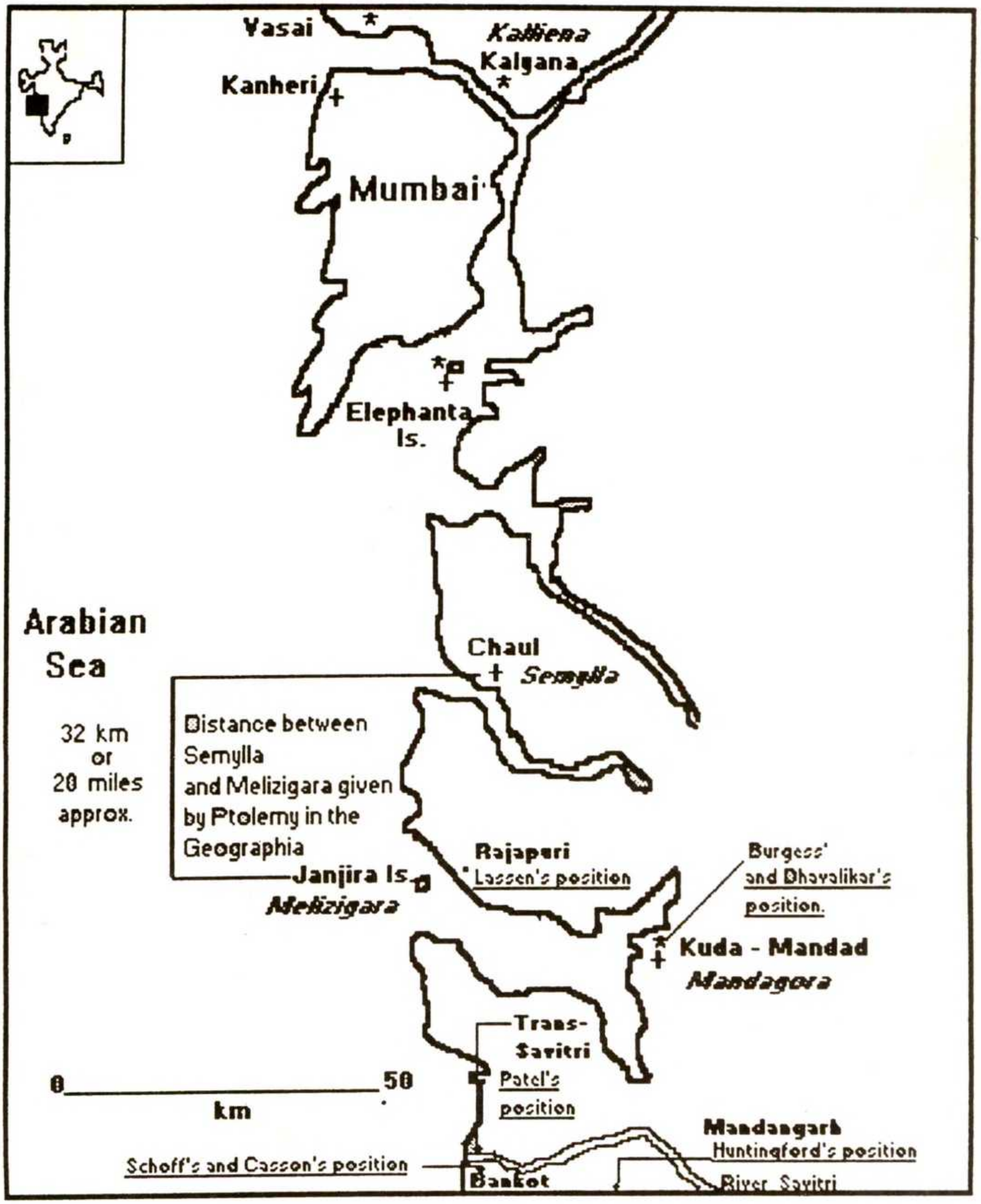


Fig. 2: Early Historic port-sites in Maharashtra

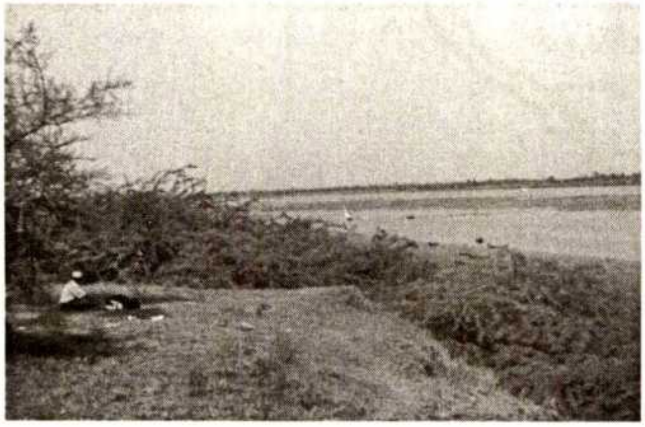


Fig. 3: Early Historic mound near Panchayat office, Bharuch

Barygaza' where the incoming ships berthed. Howell (1994: 197-99) is of the opinion that smaller sites on the Narmada indicate the berthing points. The pottery scatter and the rammed mud features indicate that Bava Chaman, about 18 km upstream from the sea, was an ancient anchorage (Fig. 5).

The survey ended by a visit to the Narmada estuary at Dighi. The mouth of the Narmada quite wide at this point and the other shore is invisible. The waters are rough and barges anchored at Dighi were tossing in the swell. It was evident that the estuary was no place for ships to berth. As the Periplus so vividly describes, the voyages had to be made through the rough estuary to the relative calm of the Narmada near Bharuch.

Kamrej Area

The next area of exploration was the estuary of the River Tapi about 50 km south of the Narmada. Stretches of the river Tapi were explored downstream of Surat. No deposits were encountered. About 15 kilometres upstream of Surat on the south bank of the Tapi, the Early Historic site of Kamrej was prospected (Fig. 1). The deposits are oriented along the bend of the river Tapi and much of the deposits are built over by the modern village of Kamrej. The extent of the site was estimated to be 1 kilometre in length and 500 m wide. The main mound, located on the outskirts of the village, has undulated shape, suggesting some kind of berthing structures. The remains of a stupa, complete with spokes, was observed at the top of the mound. The extent of the deposit was estimated to be about 5 m, overlying a 5 m mud embankment. The site yields profuse Early Historic pottery. Among the ceramic samples recovered were green glazed wares which relate to Parthian wares from the Persian Gulf. On a previous exploration of Kamrej, SG recovered fragments of well-fired reddish pottery which may belong to amphorae. The archaeological basis for the identification of Kamrej with the port-site of Kammoni listed in the Periplus has been discussed by Gupta (1993: 119-127).

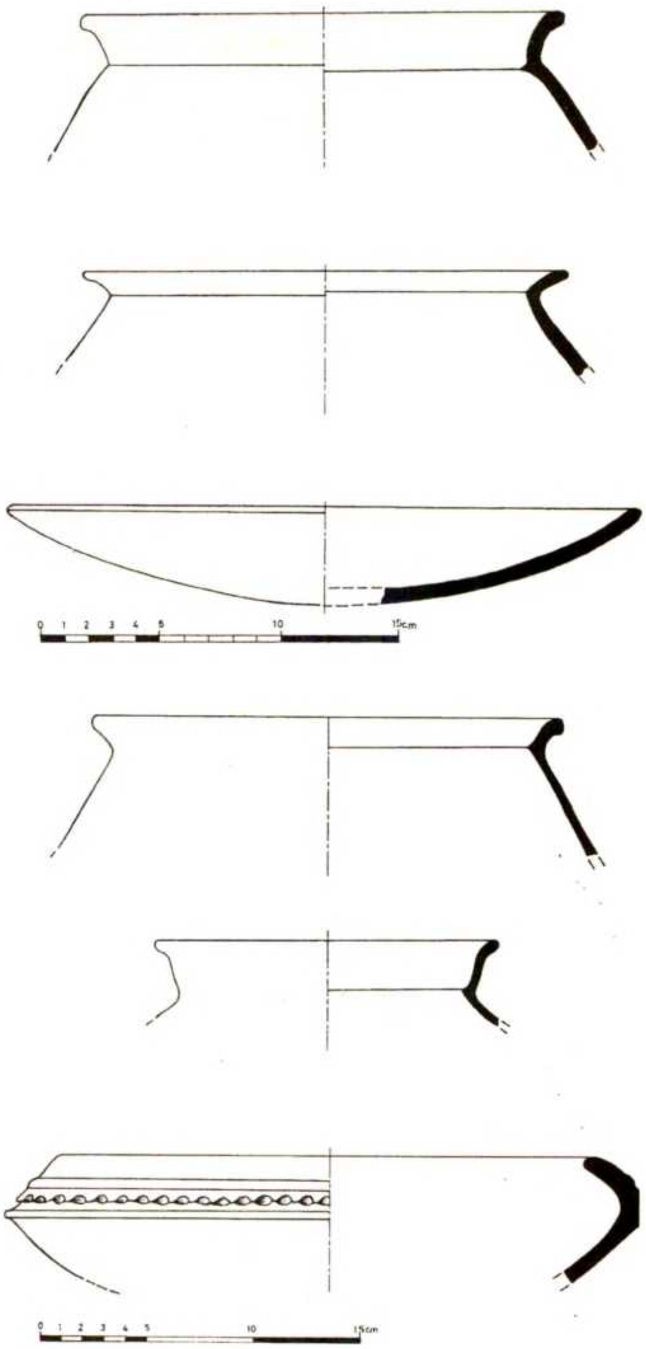


Fig. 4: Iron Age pottery found at Baba Chavan, Bharuch

Elephanta

The island of Elephanta, located south of Mumbai, seems to have been an Early Historic trading station engaged in overseas commerce (Fig. 2). Elephanta is part of the

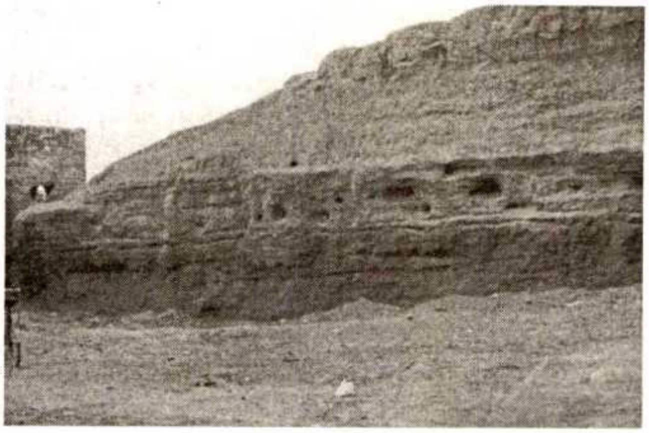


Fig. 5: View of river Narmada from Bava Chaman, Bharuch

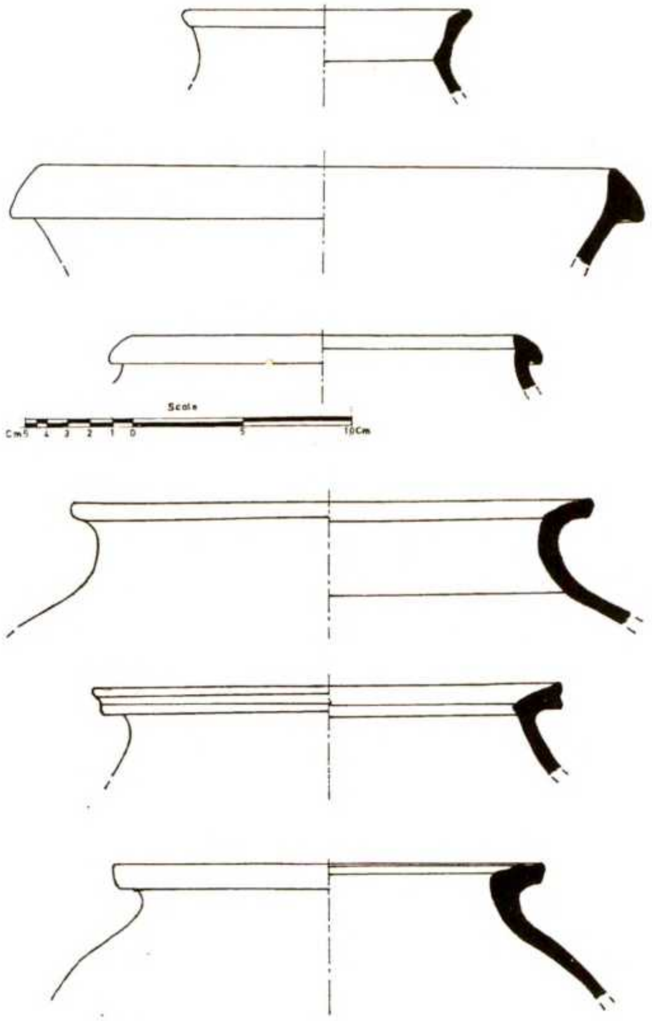


Fig. 6: Early Historic pottery from Kuda, Murud-Janjira

Mumbai harbour complex which also includes the Buddhist caves at Kanheri and Early Historic deposits at Kalyan (ancient Kalliena of the Periplus). Prospections on the island brought to light structures which may be remains of Early Historic berthing points. The discoveries have mainly centred about two locations at Elephanta, the village of Rajbandar on the south side and Morabandar village on the northeast shore of the island. At Rajbandar a brick wall uncovered by the Maharashtra Public Health Department was further excavated by archaeologists of the Archaeological Survey of India who interpreted the structure as a jetty or wharf. Three habitational levels were found corresponding to phases of raising of the jetty/wharf. The finding of Mediterranean amphorae sherds in the excavations indicates that the site was a trading station (Rao 1987: 65-66). At Morabandar also Rao (1987: 65-66) reports submerged structures and finds of Roman, Kshatrapa and Gupta coins. Tripathi (1993: 68) reports that 'the whole slopy area between the high steep hill and the shore (at Morabandar) strewn with remains of brick-made houses, stone walls and other remains and a large number of potsherds.'

A large quantity of exotic pottery, especially fragments of Mediterranean amphorae have been recovered from Elephanta island. The preliminary identification of the amphorae by SG (below) indicates a chronology from 1st to 7th century A.D. for the exisyence of the port, with its floruit in the 6th-7th century A.D. The dates for the Elephanta amphorae are congruent with the visit of the Greek travellar Cosmas to nearby Kalyana in 6th century A.D.

Chaul

The next major early Historic harbour south of Elephanta - Kalyana was located about the creek at the modern township of Chaul (Fig. 2). This was the ancient Chemulaka mentioned in an inscription at Kanheri (Luders' List nos. 996, 1033). The Periplus (section 53) and the Geographia call this port Semylla (for Chaul-Semylla-Chemulaka association see McCrindle 1884: 326-327; Schoff 1912/74: 200-201; Warmington 1928/95: 110-111). Ptolemy records that he obtained much information about western India from merchants from Egypt frequently voyaging to Semylla/Chaul (McCrindle 1884: 326).

The Early Historic port of Chaul must have been situated along the large Roha Creek which cuts into the hilly tracts of the modern Chaul township till it reaches the mouth of the Kundalika River. No occupational deposits of the Early Historic period have been yet found at Chaul. However the location of early Buddhist rock-cut caves at the edge of the Roha Creek at Chaul and the geography of the littoral help us reconstruct some functional aspects of ancient Semylla. The Early Historic Buddhist rock-cut caves directly overlooking the mouth of the Roha Creek were explored. At present the caves serve as the shrine of Hinglaj Devi, the patron-diety of the local Koli fisherfolk. The early Buddhist rock-cut caves on the Hinglaj Mata Hill offer a direct view of the open sea at the mouth of the creek. On the face of the Hinglaj Mata Hill, two small rock-cut caverns (4 x 4 ft interior) with narrow ledges (2 x 4 ft) on the side of the Hinglaj Mata Hill and approx. 25 m above the road-level were discovered. The caverns, located away from the main cave-group, have no steps leading up to them. The narrow ledge sticking out of the top cavern has four post-holes carved onto its floor indicating use of an awning as protection from the sun. The caverns afford an excellent view of the mouth of the creek. A scrapping of the surface of the deposit inside the top cavern yielded coarse potsherds of the Early Historic Period. The location and nature of the caverns suggests their use by lookouts. The evidence as a whole suggests that the Hinglaj Mata Hill marked one of the anchorages of the harbour of Chemulaka/Semylla/Chaul. The hill is situated sufficiently inside the mouth of the creek (1 km) for ships to berth safely.

Kuda (Janjira Creek)

The distance from Chaul to the town of Murud further down the coast is 35-40 km. A metalled road connects the two coastal townships. From our point of view the principal feature that was noticed on the road from Chaul to Murud — which runs alongside the shore — is the rocky nature of the coast and the absence of any significant deep-water, sheltered anchorages (coves, bays, creeks) on this stretch of the coast. Finally, it is at Murud where the next sheltered body of water after Chaul opens up in the form of the Janjira creek (Fig. 2). Observing the coastline from Chaul to Murud made it clear that, in ancient times, voyagers would have found it highly inconvenient to carry out regular landings on this rocky, open and windy coast. In effect then, the next major coastal settlements below Semylla/Chaul must have been located about the Janjira creek. The size of the Janjira creek (approx. 22 km of seawater ingress) and the more than one modern anchorages situated about its shore (Rajapuri, Dighi, Mhasla, Kuda) point towards the existence of more than one sites of the Periplus/Geographia about the creek. Fergusson and Burgess (reprint 1988: 205), exploring the Janjira creek during a study tour of Buddhist sites suggest as much: 'It seems almost certain, however, that from very early times the beautiful creek which still has Murud, Janjira and Rajapuri at its mouth, and the villages like Tamane and Mhasla at its head, must have attracted the population of a considerable town.'

There are strong reasons to believe that the settlements immediately south of, Semylla: Mandagora Melizigara, Palaepatmae and Hippokoura — lay about or near the Janjira creek and were not strung out on a 'linear' direction along the coast. The modern anchorage of Kuda-Mandad at the head of the Janjira creek offers, historically and geographically, a number of important reasons for it to be the trading-station of Mandagora mentioned in the Periplus and Geographia. On a survey of the Kuda foreshore in 1996, VS and SG recovered ceramics from a field. The pottery is Early Historic and is heavily eroded by sea water. The pottery is made out of the lateritic clay so common in the Konkan-Kanara coastlands (Fig. 6). The Mandad-Mandagora correlation acquires credibility because of (a) the natural and sheltered anchorage offered in the interior of the creek where the village of Mandad is located (b) the existence of the seafacing early Buddhist caves at this site like at the ports of Kalyana/Kalliena and Chemulaka/Semylla and (c) the existence of an Early Historic occupational deposit on the seashore near Mandad village indicating the functioning of the anchorage in ancient times (for detailed discussion see Gupta 1996: 52-58; Gupta 1997).

Conclusion

Though the full picture of ancient Konkan has still to be drawn, the evidence from the field corroborates the existence of the main ports of trade mentioned in the *Periplus* and *Geographia.* The ceramics recovered from the prospect ions, especially Elephanta, give us a good idea of the contacts of the western Indian coast with Indian Ocean lands and the Mediterranean World. The sea facing Buddhist rock cut caves were a conspicuous feature on the Konkan coast. We find them located on vantage points at Kanheri (near Elephanta), Chaul and Kuda. The Buddhist retreats, overlooking the approaches to the above harbours, must have also served as watch points and rudimentary lighthouses. The rock-cut caves are also found on the land routes cutting into the interiors from the coast, especially at points of steep passes between the Deccan plateau and the low Konkan. The ports of Soppara-Kalliena-Elephanta, forming one interconnected harbour complex on account of the closely situated anchorages, may have been the busiest hub of long distance trade on the Konkan. The Periplus (section 52) informs that Kalliena became a 'lawful market-town' and was frequented by Greek ships. The string of harbours below Kalliena, principally Chaul/Semylla and Kuda/Mandagora flourished as excellent 'creek' ports, serving the hinterland of the southern Deccan. The Konkan Survey shows the shifting nature of Early Historic port sites on the western coast of India between 1st-7th century A.D.

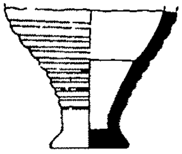
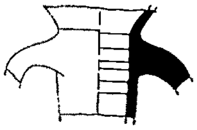
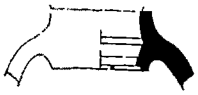
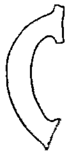
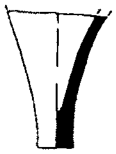
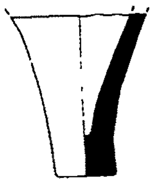
Appendix

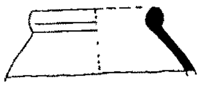
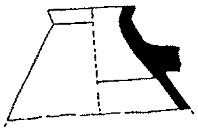
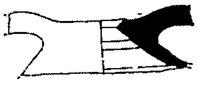
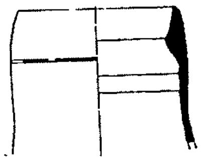
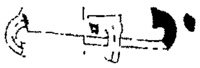
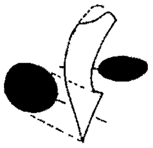
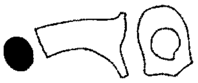
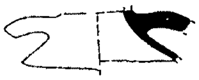
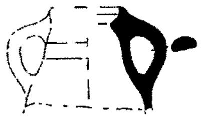
Amphora from Elephanta Island: A Preliminary Study

Sunil Gupta

A preliminary identification of a surface collection of amphorae fragments from Elephanta Island, Mumbai is presented below. I have attempted the identification by comparing the Elephanta sherds (Table 1) with published records of similar amphorae found on the Indo-Mediterranean trade routes. The principal conduits for transport of amphorae from the Mediterranean rim to India were (1) through the Egyptian Red Sea coast via south Arabia and (2) along the land routes passing through Palestine-Jordan to the south Arabian coast or the Persian Gulf coast and thence to India. In the main, I consulted the reports of excavations at the following sites: Berenike, the Roman harbour on the Egyptian Red Sea coast (Sidebotham and

Table 1: Amphorae found at Elephanata Island (00= year 2000 and Ceramic Number: 00.1)

Identification No.	Description	Measurements	Identification
ELP 00.1 	Base of amphora, ribbed body with button base, pink core with creamy white wash on surface	Diameter of button base: 2.95 cm, Average thickness of surface corrugation: 0.73 cm	Late Roman Amphora 1. The fragment is similar to amphorae produced in the Levant between 5th-7th century A.D. See Tomber and Dore (1998: 108).
ELP 00.2 	Handle and neck fragment of amphora. Brown surface with a reddish core. Ovoid cross-section of handle, ribbing on inner surface	cross-section: 2.16 x 1.3 cm	Common amphorae from the Nile Valley dated to 4th-7th century A.D. Agrees with the descriptions of Riley's Type 1 amphorae excavated from the Late Roman port site of Abu Shahr on the Egyptian Red Sea coast (Riley in Sidebotham *et al.* 1989: 150-55).
ELP 00.3 	Handle and body fragment of amphora, single handle with ovoid cross-section, soft fabric. Has a rough pinkish core with white particle inclusions. The surface is rough and covered by cream wash. White particle eruptions seen on surface.	cross-section: 2.29 x 1.7 cm	Sandy gritty buff amphora common throughout the Roman World between 5th-7th century A.D. Compare with fragment excavated from the Roman – Late Roman port of Berenike on the Egyptian Red Sea coast (Hayes 1996: Fig. 6-13: no. 13, p.163).
ELP 00.4 	Handle of amphora. Single handle having ovoid cross-section, orange-red core. Same on surface, smooth surface and core.	cross-section: 2.48 x 1.15 cm	Most likely from Palestine or Jordan. The fabric is similar to Palestinian amphorae included in Class 46 of Peacock and Williams (see Tomber and Dore 1998: 103)
ELP 00.5 	Spike base of amphora. Brown surface and core. Rough surface. A black resinous coating on inner surface.		A typical Dressel 2-4 base. However, the fabric relates to the Nile clay amphorae. It seems that the base belongs to a Dressel 2-4 form produced in Egypt. Date: 1st-2nd century A.D.
ELP 00.6 	Spike base of amphora. Rough reddish core. Surface is buff with greenish hue. Black Sand inclusions. Thick black resinous coating on inner surface.		Amphora base similar to Dressel 2-4 type. The greenish hue agrees with sources in South Italy. 1st-2nd century A.D. See description of Campanian clay by David Williams in Gupta *et al.* (2001: 7-18); also Tomber and Dore (1998: 88)

ELP 00.7		Rim fragment of jar. Reddish brown core. Rough buff coloured surface with greenish tinge. Beaded rim marked by outer ridge. Black resinous coating on inner surface.	Similar in typology and fabric to a Sicilian storage jar reported from Berenike (Tomber 1998: fig. 6-7, no. 83, p. 179-180). Date: 5th-6th century A.D.
ELP 00.8		Neck and handle fragment of amphora. Single curved handle portion with ovoid cross section. Conical shoulder. Brown surface and core with white particle inclusions. Corroded by marine action.	Common Nile clay amphora dated between 4th-7th century A.D. Similar to Riley's Type 1 reported from the Late Roman site of Abu Shahr (Riley in Sidebotham *et al.* 1989: 150-55).
ELP 00.9		Shoulder and handle fragment of amphora or jar. Pink-red core with lighter pink-red slip. Soft surface.	Probably from the Palestine region or Jordan. The fabric agrees with the descriptions of wine amphorae excavated from 6th-7th century A.D. wine presses at Khirbet Yajaz, Jordan (Khalil and al-Nammari 2000: fig. 10, no. 6, p. 53).
ELP 00.10		Rim and neck fragment of amphora. Almond shaped rim. Reddish-brown core with thick buff slip on surface. Creamish wash on interior	Comparable with Egyptian amphorae produced from Nile clays. Dated 5th-6th century A.D. Similar to Nile silt amphorae excavated at Berenike in various seasons See Hayes (1995: p. 34. fig. 15); Tomber (1998: fig. 74, p.179); Tomber (1999: figs. 27 & 28, p. 132).
ELP 00.11		Handle and body fragment of amphora or jar. Handle has a central ridge line on upper surface. Triangular cross-section of handle. Red core and surface. Surface ribbing visible on part of body surface.	Late Roman amphora, most likely from Palestine or Jordan. Similar to amphora fragment reported from from 6th-7th century A.D. wine presses at Khirbet Yajaz, Jordan (Khalil and al-Nammari 2000: fig. 10, no. 6 and 8, p. 53).
ELP 00.12		Handle of amphora or jar. Orange fabric with creamish-red slip on exterior. Ovoid cross-section of handle.	Most likely from Palestine or Jordan. The fabric is similar to Palestinian amphorae included in Class 46 of Peacock and Williams (see Tomber and Dore 1998: 103)
ELP 00.13		Handle fragment of amphora or jar. Circular cross-section of handle. Orange fabric with thick creamish-red slip on exterior.	Most likely from Palestine or Jordan. The fabric is similar to Palestinian amphorae included in Class 46 of Peacock and Williams (see Tomber and Dore 1998: 103).
ELP 00.14		Handle and shoulder fragment of amphora or jar. Pink red core with thick creamish-yellow exterior. Ovoid cross-section of handle.	Similar to ELP 00.9.
ELP 00.15		Rim, neck and handle portion of amphora. Red fabric highly corroded by sea water.	Ayla-Axum type amphora produced in the Red Sea region between 5th-7th century A.D. This amphora type has been reported from Berenike (Tomber 1998: fig. 84, p.180); from Aksum in Ethiopia (Munro- Hay 1989: fig. 16.469, p.314); and from the Yemeni port-site of Qana (Sedov 1996: 11-35).

Wendrich 1995-2000); the ancient city-state of Aksum in Ethiopia which controlled the southern Red Sea region (Munro Hay 1989); Khirbet Yajaz in Jordan where Late Roman wine presses came to light (Khalil and al-Nammari 2000); and the harbour-site of Qana in Yemen which controlled the sea routes from the Mediterranean to India (Sedov 1996). For general reference I used the standard catalogue on Roman amphorae types by Peacock and Williams (1986) and the handbook on Roman amphorae fabrics by Tomber and Dore (1998).

Most of the amphorae in the Elephanta collection are Late Roman amphorae tentatively dated to 6th-7th century A.D. However, two peg bases are typical of the Dressel 2-4 type amphorae dated 1st-2nd century A.D. The Late Roman amphorae have been sourced to three areas: Egyptian amphorae produced in the Nile Valley; amphorae of Palestinian or Jordanian manufacture; and the Ayla-Axum type amphorae produced in the Red Sea littoral region. The Dressel 2-4 type bases seem to be from Campania and Egypt respectively. The collection of amphorae from Elephanta were deposited between 1st-7th century A.D.

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Maritime Trade in Early Historic Tamil Nadu

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Abstract

The long survival of trade centres and port towns located in different ecological zones depended upon economically viable natural resources like iron ores, gems, pearl fishery, and products derived from forests. In Peninsular India, the optimum utilization of these materials and their subsequent export to the Mediterranean World, Sri Lanka and Southeast Asia in the Early Historic period is seen in the light of fresh findings from the places like Quesir al-Qadim and Berenice, Khlong Thom, Sembiran, Mantai and Anuradhapura. Recent ethnographic studies on the gem stone, iron and steel, pearl fishery and glass industries in the Tamil region suggest maritime trade activity, the development of ports and trade routes serving the hinterland in ancient times. The paper explores the long distance maritime linkages of the Tamil-Kerala region in Early Historic times.

Introduction

In this study, the geographical area related to transoceanic trade covers the Indian states of Kerala and Tamil Nadu. These states were linguistically and culturally homogenous during the Early Historic period. The archaeological and epigraphical finds in the region point to vibrant trade activity across the Kerala-Tamil Nadu region supported by extensive and reliable networks. The survival of trade centres and port towns located in economically viable resource zones are strong indicators of commercial growth and expansion. The induction of new technology for the exploitation of natural resources like iron ores and in industries like pearl fishing, gemstone cutting and cultivation of spices transformed the cultural matrix of the deep south of India. State protection and the formation of trade guilds had an indirect impact on the development of trade. These multiple factors played a crucial role in sustaining commercial activities over a period of six centuries between 3rd century B.C. and 3rd century A.D. These dynamic trading activities have been discussed in the backdrop of recent archaeological evidence that has surfaced in India, Sri Lanka, Southeast Asia and the West.

The survival of Iron Age Megalithic monuments over a thousand years shows the establishment of settlements in different ecological zones. The significant growth and continuity of such settlements has been witnessed in the late phase of the Megalithic period i.e., after 5th century B.C. The archaeological sites so far excavated in South India do not show any break between the Megalithic and Early Historic phase though there is a marked difference in their way of life. So the period of transition witnessed a dynamic cultural transformation. Megalithic practices continued into the Early Historic period. For instance, at Kodumanal, a Megalithic cist yielded potsherds with Tamil-Brahmi script reading *visaki* (Rajan 1996: 72-85). The Sulur grave yielded a punch marked coin struck at Eran (Beck 1930: 166-182). Another remarkable recent discovery, from a Megalithic grave near Kambaiyanallur in Dharmapuri district of Tamil Nadu, is that of a bilingual silver coin inscribed in Greek on the obverse and Kharoshthi (Prakrit language) on the reverse. This coin is a rare issue of the Scythian ruler Aspavarma, son of Indravarma, who ruled in the Taxila region about 30-40 A.D. (Sukavana Murugan 2001: 115). It is noteworthy to recall the bronze seal with two lines script collected from a burial at Anaikottai in Jaffna Peninsula (Raghupathy 1987: 200-202). These all denote continuity of the custom of erecting Megalithic monuments in the Early Historical period. One may, therefore, visualize that in the last stage of the Megalithic phase, they became settled people. Slowly clan based society emerged. Exploitation of minerals and ores began; industrial activities intensified; specialized craftsmanship developed; script developed or the earlier one got modified; trade routes were formed in the potential agricultural and mineral zones; various religions took root and literature proliferated. One may witness these emerging trends more strongly from the Megalithic period onwards and its culmination in the Early Historic period. For instance, the emergence of the Early

Historic phase from the late Megalithic phase is seen in the geographical areas associated with the celebrated rulers like Chera (Kongu region), Adiyaman (Dharmapuri region), Nannan (Chengam area) and Malaiyaman (Tirukkoyilur area). The capital cities like Karur, Tagadur and Koyilur, trade centres like Kodumanal and Vellalur and international ports of call like Musiri, Korkai, Kaveripattinam and Arikamedu witnessed the same cultural transformation.

Trade is considered one of the indicators for the existence or formation of state. Trade played an important role in territorial expansion during the Early Historic period. For instance, the Cheras made a territorial advance into the Kongu country (Coimbatore region of Tamil Nadu) from the Periyar river valley of present Kerala State to exercise control over economic products like semi-precious stone from Kangayam, iron ore from Chennimalai and spices from Kollimalai which considerably enriched their treasury (Rajan 1991: 111-112). It seems that considerations of trade motivated the Cheras to establish their second capital at Karur-Vanji on the banks of the river Amaravathi. The habitation mounds found in economic zones like iron ore areas, semi-precious stone yielding zones, pearl fisheries, cotton manufacturing centres and spice yielding areas are proof that there was a well-established trade network. The production of cash crops and the introduction of new technology in the manufacturing sector like textile, gem and iron industries further increased the economic viability of the Tamil-Kerala region and sustained the trading activities. On the basis of recent evidence, a quick study is made of the technology that catalysed trade related activities.

Technology and Trade

Navigation

The references in Sangam literature and in foreign accounts speak of the intense maritime trade activity that took place in ports like Tondi and Musiri on the west coast and Korkai, Alagankulam, Kaveripattinam and Arikamedu on the east coast. The innumerable literary references and the analysis of the bricks collected from the port installations at the above sites attest to the fact that people had knowledge of oceanography, boat building and port installations like wharfs and lighthouses (Athiyaman 1996; 1997: 71-72). The *ampi*, a boat devoid of mast and sail is used both in river (*Ainkurunuru* 98: 1-2) and sea (*Narrinai* 354: 5-7); *Punai* or *Kattumaram*, basically built of logs/ planks/ bamboos tied together (*Akananuru* 186: 8), a life boat (*Kalithokai* 134: 24-25) taken with big ships (*Perumpanararruppadai* 2.11: 30-35); *Timil* a type of boat used mainly for fishing and pearl fishing (*Narrinai* 111: 5-9; *Akananuru* 350: 10-15); are all indicative of the existence of boat building technology in ancient times. The boat *koduntimil* and *tintimil* (*Narrinai* 175: 1-3; *Akananuru* 240: 5-7) named so for its sturdiness needs specialized sailors called *timilar*. The ship used for international trade is invariably called *kalam* and *navay* ; for the indigenous and foreign respectively (*Narrinai* 295: 5-6). It has many sails and masts hoisted with flag (*Purananuru* 30: 10-11; *Akananuru* 152: 6-8; *Maduraikanchi* 74-83) and moves from one *pattinam* (port) to another *pattinam* (*Paripadal* 10: 38-40). One of the remarkable evidence is a ship motif collected from the 5th season (1997) of the excavation at Alagankulam, a Pandya port, on the mouth of the river Vaigai. The ship was engraved as graffiti on a Rouletted Ware sherd. L.Casson of New York University who examined this graffiti identified it as the representation of one of the largest type of Greco-Roman three mastered ships used in the trans-oceanic voyages (Kasinathan 1997). One must recall here, the Vienna Museum papyrus, a commercial document written in Greek and executed between a Musirian and Alexandrian trader which specified the volume of the goods carried to Alexandria in a single ship (Rajan 2000: 94-104). The references like *Yavanar iyarriya vinaiman pavai* (the beautiful lamp made by *Yavanas*), *Yavanappavai*, *Yavanarothima vilakku* (*Yavana* lamp), *vankan Yavanar* (war like *Yavanas*), *Yavanarirukkai* (residence of *Yanavas*) and *Yavanattatchar* (*Yavana* carpenter) found in Sangam literature further supports this phenomena. The scenario is strengthened with identification of extensive port infrastructures like wharf, lighthouse and warehouse at Kaveripattinam (Soundrarajan 1994: 21-42; Kasinathan 1999: 54-60). The term *munturai* (*Akananuru* 130: 12; 201: 4; 206: 13; *Pattinapalai* 173) refers to a harbour which lies near the estuary whereas the *perunturai* (*Narrinai* 295:6; *Akananuru* 27:9) refers to the actual place where the cargo was handled. The ships carried the goods well into the river mouth without slackening sail (*Purananuru* 30: 11-13) which indirectly suggests that the ancient Kaveri river mouths were wide and deep enough to allow boats to move in freely. In few cases, the small boats were pressed into the service to carry the goods from the big ships anchored in the open sea to the harbour (*Purananuru* 343: 5-6).

For effective seafaring, awareness of tide, current, wave action, wind movement and position of stars is essential. The term *otam* (*Narrinai* 117: 1-2; 335: 1-3; *Akananuru* 123: 12-13; 220: 12; 300: 16-17) is used to denote high tide and low tide. The movement of wind (*karru*) and its effective utility in the trans-oceanic voyage is also recorded (*Narrinai* 4: 4; 31: 8: 295: 6). Knowledge of astronomy is well reflected in the Sangam literature at several places. The astronomer known as *arivan* (*Tolkappiyam Porulatikaram 17*) forecast the monsoon, drought period and even changes in political rule based on the position of the stars (Gurunathan 1993: 122-127). The knowledge of names of different stars and their position would have been effectively used by the mariners to navigate. Another interesting feature is the use of land-finding birds in a ship *vangam* (*Nalayirathivvyaprabandam* 692: 3-4). Though the reference is late, the usage of land-finding birds dates back to Harappan times (Rao 1987: 8). The Sanskrit manuscript *Yuktikalpataru* refers to these birds as *disakakas*. Pliny states that mariners from Taprobane (Sri Lanka) handled this bird (Mc Crindle 1901: 55). The Buddhist text *Digha Nikaya* (1.222) of *Sutta Pitaka* also confirms this (Davids 1890). The use of stone anchors is also mentioned in literary accounts (*Maduraikanchi* 375-379) and the recent discovery of stone anchors, though late in period, confirms the continuity of the tradition (Jayakumar and Athiyaman 1996: 129-136). This acquired and accumulated knowledge like boat building, local current, monsoon winds etc would have helped to multiply mercantile activity and sea-traffic on the coasts of Tamil Nadu and Kerala in Early Historic times.

Pearl

A recent ethno-archaeological study made on the traditional diving practice in Gulf of Mannar helps one to understand the economic viability of the pearl fishing industry that existed in the pre-Christian era (Athiyaman 1997a). Even today the people of Gulf of Mannar go for diving without any breathing aids to the depth of six fathoms and they often stay on the sea floor for about 54 seconds. The study proves beyond doubt that the references found in the literature and foreign accounts to pearl fishing in the Gulf of Mannar are not an exaggeration. The earliest account of pearl and chank fishing in Tamil Nadu is given by Megasthenes (Arunachalam 1952: 23). Though the method of diving is not adequately recorded, many of the Sangam poems like *Kalithogai* (131: 22) and *Akananuru* (350: 10-11) speak of the fishing community *paratavar* (*Barata* in Sri Lanka) who resided at the Pandyan capital Korkai and were involved in pearl fishing (*Cirupanarruppadai* 56-58). The *Mahavamsa* refers to eight kinds of pearls presented to king Asoka by king Devanampiya Tissa (250-210 B.C.). Another Sri Lankan king Duttagamani (161-137 B.C.) decorated his hall with pearls which establishes the existence of pearl fishing in Gulf of Mannar (Geiger 1950: 78; 207). The Periplus of the Erythraean Sea mentions that condemned criminals were used at the Pandyan port of Korkai in the Gulf of Mannar for pearl fishing (Mc Crindle 1984: 140). Strabo, Pliny and Ptolemy also refer to pearl fishing. The port-site of Korkai on the east coast of Tamil Nadu and Mantai on the west coast of Sri Lanka were the two important Early Historic harbours in the Gulf of Mannar. The pearl oysters of *P.fucata* type grow on pearl beds or banks (*paar* in Tamil). Due to the frequent migration of pearl oysters to opposite beds in the Gulf of Mannar of India and Sri Lanka the pearl divers have to move frequently between Tamil Nadu and Sri Lankan coast.

Gem Stone

Another industry that must have fetched a large amount of foreign money to the Tamil region is the gemstone industry. India's tradition in gemstone is elaborated in the *Arthasastra, Ratnasastra, Visnudharmothara, Brahsamhita, Yukitikalpataru* and Sangam literature. The availability of semi-precious stones since Harappan times gives credibility to these references. The Greeks introduced intaglios and cameos in India. Two intaglios (a garnet and a carnelian) representing a grazing horse (from Vellalur) and a woman and a cameo representing fish on carnelian (from Karur) are fine examples. A recent study carried out on the traditional bead making industry at Kangayam by the author in the backdrop of the Kodumanal excavation proved the continuity of this industry (Rajan 1995). Gem stone industry of the Kongu region (Chera country) played a crucial role in trade contact with the Mediterranean. Beads of sapphire, beryl, agate, carnelian, amethyst, lapis lazuli, jasper, garnet, soap stone, quartz, onyx, cat eye, etc., found in different manufacturing stages (finished, semi-finished, polished, unpolished, drilled and undrilled condition) in the excavation at Kodumanal stand as testimony to their production (Rajan 1991: 111-112). The Sangam poem *Patirruppattu* (67: 1; 74: 5) refers to this site as *Kodumanam*, famous for gems. Beryl, in particular, was more highly valued than gold. These finished beads were sent down to Musiri via Palaghat gap on the Kerala coast for final shipment to the Roman world.

Beryl, sapphire and quartz were found in the mines in and around Padiyur, Sivanmalai and Arasamplayam respectively. Even today, using simple instruments, the artisan can produce excellent quality beads. The gems are bored by using instruments like steel needle fixed with corundum (*kurundam* in Tamil) and bow drill. The bead to be drilled is fixed on the wax and while boring, water kept in a coconut shell is made to drip on the bead to keep it cool. The use of simple instruments and the long survival of this tradition recall the technology adopted in ancient days. The inheritance of this technology is reflected in the literature.

References like sparkling (*milira*) gems (*mani*) appearing on the ground due to the thrust of the toe of running dear (*Purananuru* 202: 1-8); to the cattle keepers (*kovalar*) collecting sparkling precious stones (*katir mani*) while going for cattle grazing in pastoral (*mullai*) region (*Patirrupattu* 21: 20-23); to gems collected while tilling the land (*Patirrupattu* 58: 12-19); to gem-borer (*tirumani kuyinar*) (*Maduraikanchi* 511); to the whetstone/lapstone maker (*cirukarotan*) speak of the existence of this well established industry. The gemstone trader (*maniya vannakkan*) is referred to in the Arachalur Tamil-Brahmi inscription (Mahadevan 1968: 57-73). The occurrence of the majority of Roman coin hoards in the gem industry area of Chera country, Pliny's protest and Tiberius' anguish over the huge amount of Roman wealth pouring into the foreign land are fine reflections of the dynamic gem trade under the Cheras.

Metallurgy

Another important industry is the iron and steel industry. The traditional crucible steel has been produced out of high carbon alloys in India before the 4th-3rd century B.C. This is well reflected in the Classical Mediterranean accounts (Bronson 1986: 13-51). Pliny's *Natural History* identifies the Chera country as the source of iron to Roman world (Bronson 1986: 18). This tradi- tional method was in vogue till the 17th century in Tamil Nadu (Buchanan 1807). The technical terms like *irumbu* (iron) (*Akananuru* 4: 3), *ekku* (steel) (*Purananuru* 26: 5-6) *kollan* (black smith), *karumai kollan* (skilled black smith) (*Purananuru* 21: 8), *ulai* (furnace) (*Perumpanararruppadai* 437), *ulaikudam* (workshop) (*Purananuru* 170-17) *ulaikal* (anvil) (*Purananuru* 170: 11), turutti (bellow) (*Perumpanararruppadai* 206; *Akananuru* 224), *visai vangu* or *mitulai*(pedal bellow) (*Perumpanararruppadai* 207), *kudam* (crucible), *kuradu* (tong) and *kurukku* (nozzle or blow pipe) found in Sangam literature reveals the technical depth of this industry in Early Histoic times (Rajan 1994: 91-105). The nineteenth century travellers identified three different types of crucible process namely Deccani or Hyderabad process, Mysore process and Tamil Nadu process. In Tamil Nadu process, the charge consisted of wrought iron produced separately, which was then sacked in closed crucibles (Verhoeven 1987: 145-151). The recent chemical analysis and metallographic studies carried out on the iron object collected from the iron producing site at Guttur in Dharmapuri district by Raghunatha Rao and Sasikaran (1997: 347-359) showed the evidence of cast iron which was attained through the maintenance of high of temperature around 1300° C over a long period. The Sangam literature *Kurunthokai* (155) refers to the manufacture of a cast iron bell by the wax method. The study of steel production site at Mel-Siruvalur in Tiruvannamalai district (Srinivasan 1994: 44-59) clearly proves that high quality iron and steel were produced in Tamil Nadu. While other parts of India followed the technique of caburisation, the smelters of Tamil Nadu followed the technique of decarburisation as the carbon content in the iron ores is relatively high here. The discovery of separate furnaces like conical furnace for iron and crucible furnace for steel at Kodumanal goes well with this process (Rajan 1991: 111-112). It is quite clear that a new technique is conceived here to accommodate the locally available high carbon content iron ores. This high quality steel was at a greater demand in the West for a long period.

Textile Industry

Textile impressions on pottery found at Mohenjodaro, Nevasa, Chandoli, Lothal, Alamgirpur, Noh, Rang Mahal, Kaundinyapura and Kodumanal indicates the presence of this industry in India since Harappan times. In South India, the making of textiles in the Early Historic period is suggested by the terracotta spindle whorls and woven cotton pieces found at Kodumanal (Rajan 1996: 72-86) and the dying vat at Uraiyur (Raman, *IAR* 1964-65: 25-26) and Arikamedu (Begley 1993: 93-108).

Thus, the availability of natural resources and forest goods in the western part of Tamil Nadu supported the technological advancement made in gemstone, iron and steel industry which nourished the demand for goods from the Mediterranean and Southeast Asian countries.

External Trade

Trade with the West

The literary, archaeological and numismatic evidence suggests that trans-oceanic voyages between ancient Tamilakam and the Mediterranean go back to pre-Augustan times (before 31 B.C.). Republican coins from Lakshadweep (Suresh 1992:71), Kallakinar (Raman 1992: 21) and Tiruppur (Suresh 1992:68) in Tamil Nadu suggest that Roman trade with India was initiated in the pre-Augustus period itself. The major items of export shipped from the west coast ports of Muziris, Tyndis, Nelkynda and Bakare were pearls, semi-precious stones (particularly aquamarine beryl), precious gems (sapphires), iron and steel, forest goods like teak, akil, sandal, spices and ivory. All these items, except the pearl are primarily the products of Kongu region (present Coimbatore and Erode districts) and the adjoining Western Ghat area. Naturally, it is not surprising to see the largest number Roman coin hoards in India concentrated in the Kongu country (Fig. 1). It is quite relevant to deal with beryl at this point as they were extensively exported to western world along with spices. In *Astadhyayi* (4.3.84), Panini who flourished around 500 B.C. mentions that the mineral came from the city of Vidura and hence was named *vaiduriya: Vidurat syah*. Later it was stated by Patanjali (*Bhasya* 2.313) that Vidura was only the gem-cutting centre whereas the mines were in the mountain *valavaya*. Buddhadhatta identifies this beryl came from the mountain *Kongavalikasimanta* which is not far from Vidura. Here the term *konga* in *kongavalikasimanta* probably indicates the *kongu* region. It is now well known that the beryl mines were found in and around Kangayam and particularly at Padiyur, a site located about 10 km west of Kangayam in Kongu country. Alfred Master has suggested that *veluriya*, the Pali equivalent for beryl, was actually a Dravidian word (preceding Panini's *vaidurya*). It is therefore possible that the word for beryl retained in Pali as *veluriya* converts into *vaidurya* in Sanskrit. The Greek named it as *beryllos*. The Latin word *beryllus* (close to Greek *beryllos*) gave rise to English word beryl (Biswas 1994: 139-154).

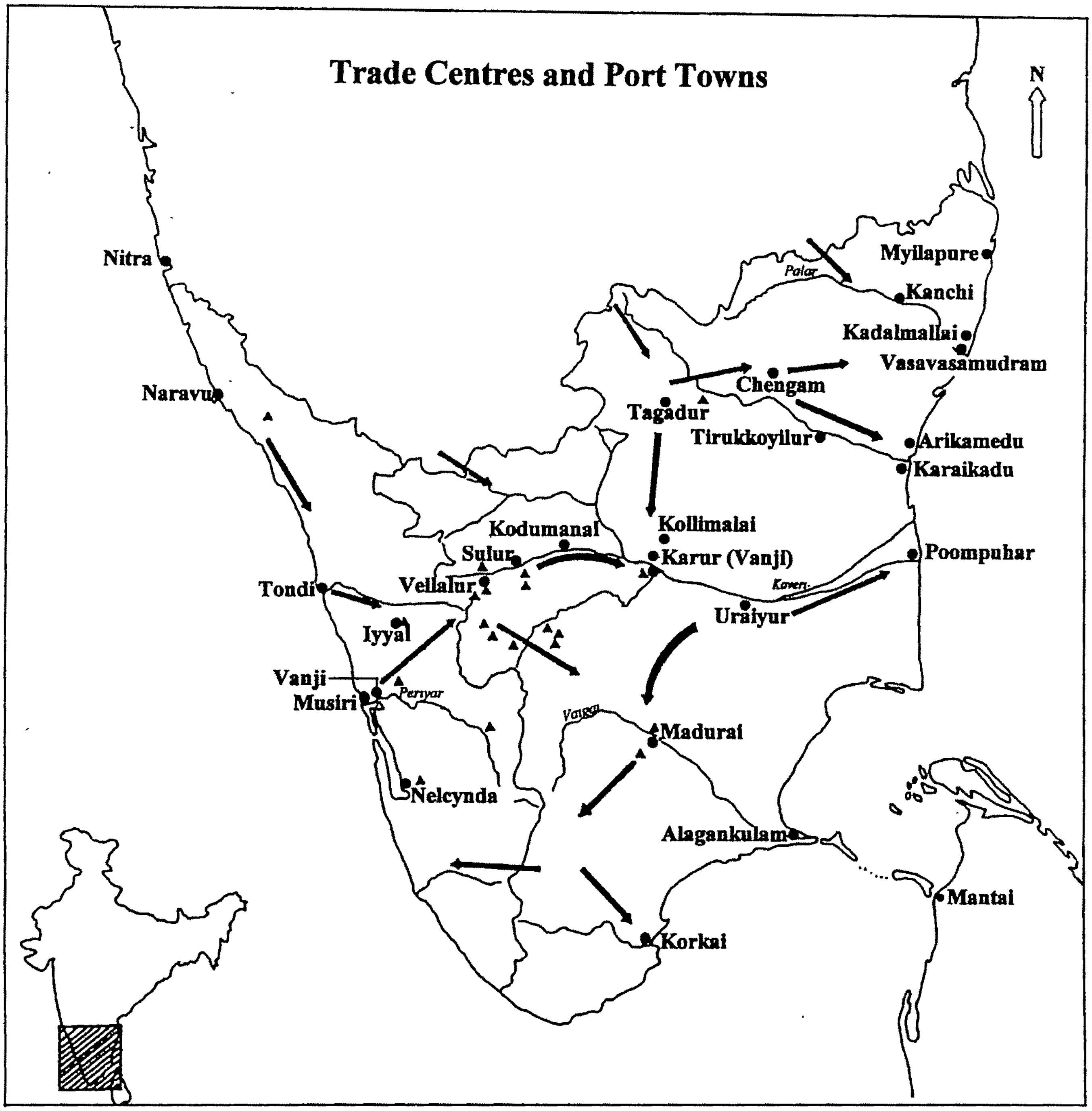
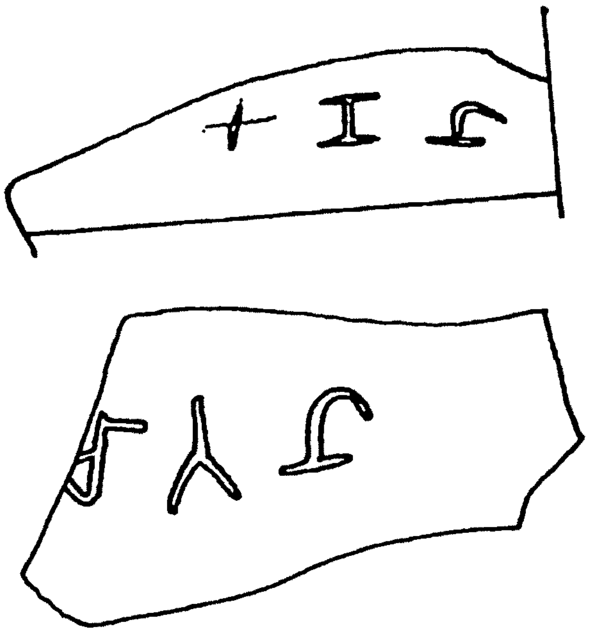


Fig. 1: Trade centres and port towns in Tamil Nadu

Much has been said about export goods based on the classical Greco-Roman accounts which need not be repeated here except the recent findings. Recent findings of Mediterranean origin include coins, terracotta figurines, jewellery, intaglios, amphorae and Arretine Ware. The site Vellalur, located on the left bank of the river Noyyal, is ideally situated on the ancient trade route connecting Karur (the Chera capital) and Musiri, the Chera port on the mouth of the river Periyar accessible through the Palghat gap. The maximum number Roman coins found so far in India have been recovered from this site. In association with coin hoards, few Roman objects were also recovered. Among them, a gold ring representing a lady dressing her hair, another ring having a dragon and the head of a Greco-

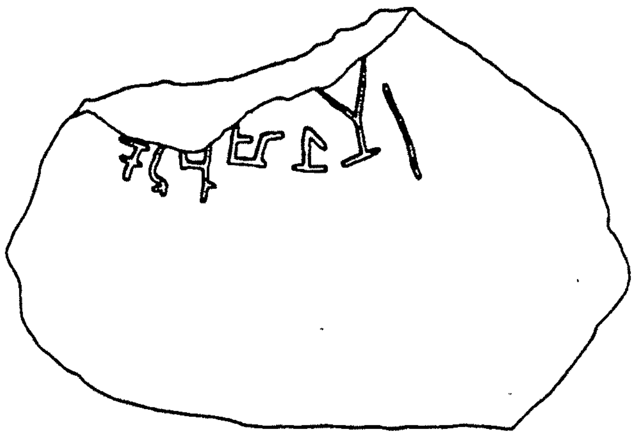
Roman soldier with elaborate head gear and two carnelian objects representing a grazing horse and a fish are noteworthy (Suresh 1992: 57). At Karur also gold objects like chariot rider, horse rider, bowl with an unidentified animal and an unusual figure of a man wearing a headgear with his body from neck downwards converted into a scorpion tail have surfaced. A terracotta figurine of Mediterranean origin unearthed at Kodumanal along with a Roman coin and a Rouletted Ware also needs to be mentioned. The site of Kodumanal is one of the biggest Early Historic industrial sites showing evidence of gemstone and steel industries. As stated above, the technology involved in the gemstone and steel industry played a crucial role in fetching a large amount of Roman artefacts to this region. It is quite possible that Roman traders had a settlement in Kongu country. Though Indian merchants had continuous trade relations with the West, it seems that few Indian traders migrated to the West. However, there are quite a number of literary and epigraphical references to Greco-Roman settlements in Indian soil. The material evidence suggests that Akikamedu and Kaveripattinam had such Roman settlements. The reference in *Tabula Peutingariana* to a temple of Augustus at the Chera capital Vanji, though not archaeologically proved, has to be seen in this background. Likewise, the Tamil traders also visited the trade ports on the Egyptian Red Sea coast. This is suggested by the the recent findings of Tamil-Brahmi inscribed potsherds with the names of (merchants?) like *kanan, catan* and *korpuman* from the Red Sea ports at Qusier al Qadim and Berenice (Mahadevan 1998: 17-19; Whitecomb 1979; 1982; Fig. 2). The knowledge of the monsoon wind which enabled traders to make a risk free voyage and to cross the Arabian sea in the span of 40 days from Ocelis to Muciri further boosted maritime commerce. The long stretch of coastline particularly along the western coast open to Arabian Sea became a heaven for Roman maritime traders. Many ports such as Barygaza, Suparaka, Cranganore, Muciri and Nelcynda on the west coast and Korkai [Kareoi or Colchi], Alagankulam, Kaveripattinam [Camara or Khaberis] and Arikamedu [Poduca] on the east coast played an active role in the advancement of seafaring activities. The Musiri-Alexandria trade contract as found in the Vienna papyrus has to be seen in this background.

The remarkable recovery of a papyrus of mid-second century A.D. clearly reveals the nature of the commodity trade between the Chera ports of Muciri and Roman port of Alexandria (Harraur and Sijpesteiju 1985: 124-155; Sidebotham 1989: 195-223). The papyrus written in Greek on both sides contains the text of an agreement between two shippers whereby one contracts to serve as an agent for a cargo belonging to the other and is responsible for its transportation from Muciri to Alexandria. Unfortunately, the names of the merchants are lost. However, the discovery of personal names like *korpuman, kanan* and *catan* suggests the nature of the ethnic groups involved in Indo-



Quesir al-Qadim

Tamil-Brahmi inscribed potsherds
kanan [top]
catan [bottom]



Berenice

Tamil-Brahmi inscribed potsherd
korpuman

Fig. 2: Tamil Brahmi inscribed potsherds from Red Sea port Quesir al-Qadim and Berenice

Roman sea trade. The content of the document especially the detail of the cargo is quite interesting, as most of them were the products of the ancient Chera country. According to Casson, the value of cargo executed in this single agreement alone is equivalent of purchasing 2400 acres of farmland in Nile delta (Casson 1992: 8-11). This document is the reflection of an agreement between two traders, likewise in a single season alone there would be a number of shipments. In the light of Vienna papyrus document, one may visualize the large amount of Roman antiquities in the form of coins, jewellery, ceramics, intaglios and terracotta figurines that are found in export oriented economic zones (Rajan 2000: 93-104). This unquestionably suggests the intensity of the maritime trade contact.

Trade with South East Asia

Southeast Asia effectively came into maritime contact with India due to the influences of the monsoons, local currents and large inland water traffic. Lithic and literary records make references to this region as *Suwannaphum* (literally meaning Land of gold). As the region did not report plentiful gold deposits so far, the scholars felt that *Suwannaphum* could be referring to bronze, the colour which resembles gold or a land rich in resources (Sirsuchat 1996: 242). The Indian merchant community moved in groups under the banner of guilds (probably *manigramattar* of Kaveripattinam?) into Southeast Asia and made permanent settlements. This situation could not be witnessed with the West.

The impact of Indian culture in Southeast Asia is well established in the beginning of the 5th century A.D. but data showing its influence during the Early Historic period was minimal until recently. However recent works have brought to light certain tangible evidence to show early maritime contact between Tamil Nadu and Southeast Asia.

Specialised mercantile communities started venturing into the sea by the middle of the first millennium B.C. for by that time ports had emerged on the Indian coast. The mercantile community dealing with the salt, textiles, metal, gems, gold, pearl, spices etc. were integrated into a trading system. The frequent references to trade guilds in Peninsular India and in the Ganga Valley indirectly points to this scenario. Glover feels that the great expansion of Southeast Asian exchange networks is closely connected with the demand for exotic and luxury items by the urban people of the Mediterranean basin, which induced the mercantile community to venture into the sea towards Southeast Asia (Glover 1996: 129-158). Among the spices, the cloves from Moluccas received much attention of the traders. The unopened aromatic flower buds of the tree *Eugenia aromatica* would have been exported through South Indian ports particularly through the ports of Kaveripattinam and Musiri to the western world. The reference found in the Sangam literature *Pattinappalai* (lines 191-194) refers to the item of Kalakam (*kalakattu akkam* meaning objects from the place Kalakam) and red coral from East Sea (*gunakkadal tukir*). Though the exact location of the places is not identified, scholars feel that it points to the area covering southern Thailand and northern Malaysia where important archaeological sites with Indian goods are found.

The site of Khlong Thom (also known as Khuan Lukpad or Bead mound) in Krabi Province and the site of Chana in Suratthani province of Thailand are known for their glass and semi-precious stone beads (Glover 1996: 64) (Fig. 3). A number of etched agate and carnelian beads, carnelian lion pendent, glass collar beads similar to those from Arikamedu, Roman carnelian intaglios and other intaglios like elephant, lion and the god Perseus are some of the items found at this site (Veraprasert 1987: 323-333; Bronson 1990: 213-230). One of the interesting finds is of a tortoise or a turtle made of quartz found at Kodumanal, similar to a piece at Srikshetra in Thailand (Di Crocco 1996: 164, pl. 5). In addition to the gemstone industry, tin was also manufactured at this site which would have been exported to India in exchange for gemstones and glass. In the course of exploration, in 1992-93, archaeologists led by Noboru Karashima bought to light an inscribed small flat rectangular touch stone of 3rd-4th century A.D. at the temple Museum of Wat Khlong Thom in Thailand. The eight letters in Tamil-Brahmi reads *perumpatankal* meaning "(this is) the (touch) stone of Perumpatan" (Fig. 4a). *Perum* means big and *patan (pattan)* means goldsmith. Therefore Perumpatan is a title or the name of the goldsmith who possessed this touchstone. This is first Tamil inscription so far found in Southeast Asia (Karashima 1995: 1-25). Another important finding is of a square copper coin with a tiger on the obverse and an elephant on the reverse (Shanmugam 1993: 81-84). Though there is no legend on the coin but still one can safely presume that this coin belongs to the Sangam period as the square coins were found only in Sangam period and the tiger figurine stands for the *insignia* of the Sangam Cholas (Krishnamurthy 1997). Pallava coins with bull on the obverse and double masted ship motif on the reverse have been unearthed in Southeast Asia. Another Tamil inscription originally discovered in Kho Khao island and presently preserved in the Nakhon-Si-Tammarat Museum is the famous Takua Pa (ancient Takkola of Ptolemy) inscription of Pallava Avaninaranam (Nandivarman III A.D. 846-869). The above evidence shows the continuous presence or contact of peninsular Indian traders with Thailand. The major ports like Khlong Thom and Muang Thong (Ko Kho Khao) on the Andaman sea coast on the west and Khao Sam Kaeo and Laem Pho on the south China sea coast on the east of Thailand played a pivotal role in linking Vietnam and China on the east and Indian and Mediterranean countries on the west in the Early Historic period (Sirsuchat 1996: 244-246).

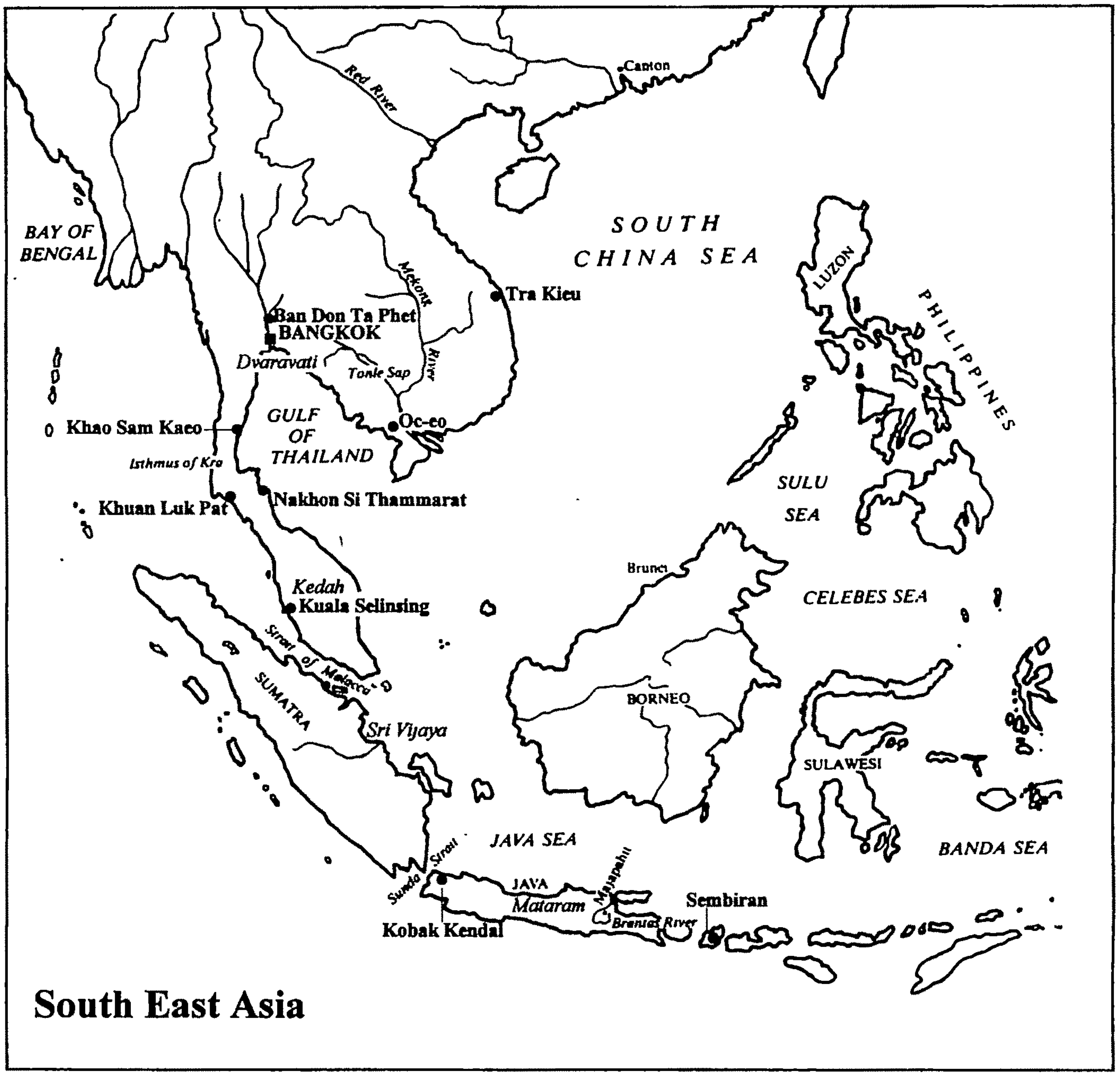
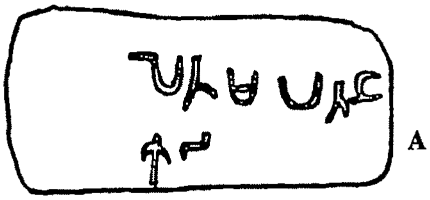


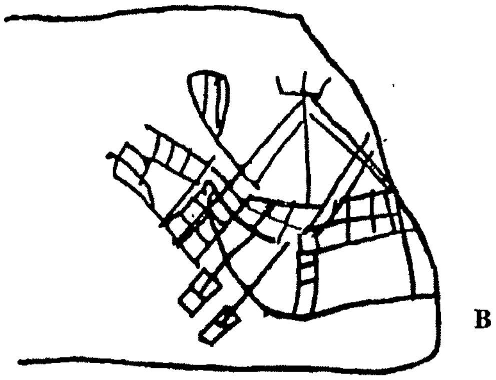
Fig. 3: Southeast Asian sites having south Indian contact

Tamil Nadu does not have deposits of copper or tin. Therefore tin would have been imported from Southeast Asia. The high-tin bronze bowls found at Adichchanallur and Kodumanal must have imported from Southeast Asia for these are not compatible with Indian metallurgical signatures (Glover 1996: 77). The Indian made glass and stone beads datable to 4th century B.C. found in the burial site Ban Don Ta Phet in Thailand, together with high tin bronze vessels suggests that the Tamil Nadu bronze material must have been imported from Thailand (Srisuchat 1996: 242-243). The lead and tin ingots found at Khuan Luk Pat found their way to Sri Lanka. The excavations carried out at Abhayagiri Vihara in have yielded tin ingots (Abeyratne 1990), which incidentally suggests that the lead and tin ingots must have reached Tamil Nadu coast either through Sri Lanka or directly from Thailand (Sirsuchat 1996: 251-252).

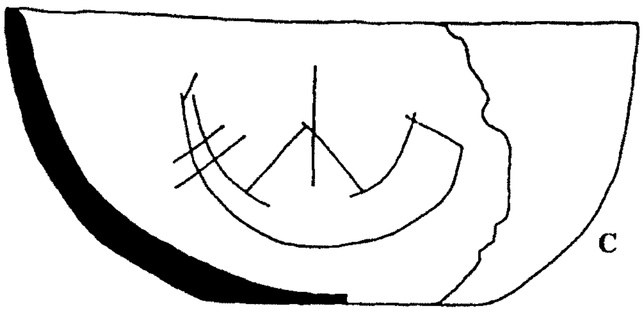
Glass was an important trade commodity between India and Southeast Asia. The chemical and spectrographic analysis shows that glass objects were made of three basic



Inscribed Touchstone reading perumpatan kal collected from Khlong Thom, Thailand



Alagankulam : Boat motif on rouletted ware



Anuradhapura : Boat motif on rouletted ware

Fig. 4a: Inscribed touchstone reading *perumpatan kal* collected from Khlong Thom, Thailand
b: Inscribed Rouletted Ware with boat motif collected from Alagankulam, Tamil Nadu
c: Inscribed Rouletted Ware with boat motif collected from Anuradhapura, Sri Lanka

compositions namely potassium-silica, lead-barium and soda-lime. The potassium-silica based glass was manufactured at Arikamedu in Tamil Nadu and then at Mantai in Sri Lanka. The lead-barium glass had its origin in China and the soda lime glass in the West. Based on these chemical compositions one can easily locate the origin of ancient glass in Asia. For instance, the single coloured small potassium bearing glass beads of Arikamedu and Mantai reached Southeast Asia. The tombs of the Han dynasties in the Yellow and Yangzi river valleys of south China yielded quite a number of glass beads which were very popular between 200 B.C. and 200 A.D. Along with the lead-barium glass beads of China, potassium-silica glass beads were also found at Guangdong and Guangxi provinces. Among the objects, glass bowls, cups and plates are quite interesting. Even the historical records of the Han dynasty says that Emperor Wu (140-187 B.C.) sent people to the Southern Sea to buy glass. It seems that these glass beads reached China from Tamil Nadu but after passing through sites like Mantai in Sri Lanka, Khlong Thom in Thailand and Oc-Eo in Vietnam. The Indian traders must have even carried Roman glass objects after making transshipments at Muziris in Kerala and Arikamedu or Kaveripattinam in Tamil Nadu. The Roman dark blue glass bowls appeared at Canton, Hanjian and Nanjing in the Han tombs of southern China belonging 1st century A.D. (Jiayao 1996: 127-138). Based on the current level of knowledge Francis (personal communication) feels that the potassium-silica based glass beads were first manufactured at Arikamedu (3rd c. B.C. to 3rd c. A.D.). Thereafter the craftsmen moved from Arikamedu to Mantai in Sri Lanka and then to Khuan Luk Pat in Thailand and to Oc-Eo in Vietnam. From Khuan Luk Pat, they went to Kuala Selinsing in Malaysia. Further he felt that due to the complexity of the process and its relative difficulty in transferring the technology, this industry must have been in the hands of Tamils (Francis 1996: 141).

Glass cullet, carnelian, agate, steel were exported from the Tamil Nadu coast. Among them glass occupies an important position. Glass and semi-precious stone beads were also collected from the site at Gilimanuk in West Bali of Indonesia (Ratna Indiraningsih 1985: 133-141). Carnelians, particularly the etched variety were exported to Southeast Asia. The sites like Ban Don Ta Phet and Khlong Thom are fine examples. The regular concentric grooves found in the drill holes of the semi-precious stone beads found at Khlong Thom and Ban Don Ta Phet are clearly indicative of Indian origins.

On the ceramic side, Walker (1980: 225-235) has identified three vessels of Indo-Roman Rouletted Ware of 1st c. A.D. belonging to the Buni grave complex on the north coast of Java. Glover identified another Rouletted Ware at Tra Kieu in Vietnam. Rouletted Ware is also reported at Darussalam in Brunei and Kobak Kendal and Sembiran in Indonesia, Tra Kieu in Vietnam and at Mantai, Kandarodai, Tissamaharama and Ambalantota in Sri Lanka (Glover 1989: 4-5; 1996: 67; Gogte 1997: 70). Ardika unearthed 79 sherds of Rouletted Ware of which 78 came from Sembiran and a solitary example from Pacung. The x-ray diffraction and neutron analysis carried on the Rouletted Ware from Sembiran, Anuradhapura and Arikamedu indicate that they all have one geological source in terms of their clay and temper compositions (Ardika, *et.al* 1993: 101). By taking a thread from this one geological source, Gogte made further study and concluded that this fine pottery was produced with locally available chlorite based clay at multiple centres in the Lower Ganga plain with the epicentre in the Chandraketugarh-Tamluk region of Bengal and then the ware was exported to other ports (Gogte 1997: 69-85). One needs a close look at this hypothesis in the light of Alangankulam findings. The six metre cultural deposit at Alagankulam yielded Rouletted Ware in abundance from the lower most level and it was in continuous use for more than 400 hundred years. If we consider this ware came from lower Ganga valley without any break for over three centuries then certainly the Sangam literature would have noted this flourishing ceramic trade. But there is no such reference. Further, the site has not yielded ther artefacts of the lower Ganga valley. Under this circumstance, Gogte's findings need further investigation.

Trade with Sri Lanka

The emerging scenario of the recent years suggests that Sri Lanka's cultural contact with India has been more than with any other country. The recent spurt in the archaeological activities in Sri Lanka and India, particularly in south India, reflects these indicators more explicitly. The similarity between the microlithic tools of *Teri* sites (Deraniyagala 1992); the structural and cultural similarities between Megalithic monuments (Seneviratne 1984: 237-307); the story of the conquest of Sri Lanka by prince Vijaya and his subsequent marriage with the Pandya princess; the account of the establishment of Buddhism found in *Mahavamsa* and *Dipavamsa;* the use of Brahmi script for writing Prakrit and Tamil; similarities in coins found in India and the neighbouring island country of Sri Lanka are fine indicators of continuous cultural contact between these two regions (Pushparatnam 2000). These indicators are inter-related and it cannot be seen in isolation as it had wider implication in understanding the cultural matrix of both the counties.

The cultural material unearthed in the excavations at Anuradhapura (Daraniyagala 1972; 1986; 1990; Coningham 1990, 1991; Coningham and Allchin 1992), Pomparippu (Begley *et al.* 1981), Ibbankatuva (Bandaranayake 1992) Mantai (Carswell and Prickett 1984), Kantarodai (Orton 1993), Mahagama (Parker 1909) and Ridhyagama (Bopearachchi 1996: 64-65) shows the Indo-Sri lankan contact during Early Historic times (Fig. 5). The excavation at Kantarodai, situated in the centre of the Jaffna Penninsula yielded a Black and Red Ware phase followed by a Rouletted Ware phase which is comparable with the one found in Tamil Nadu (Begley 1973). The inscribed Rouletted Ware with Prakrit language affinity of Sri Lankan origin found at Arikamedu, Kaveripattinam and Alagankulam is further proof of contacts (Mahadevan 1994: 1-26, 1995: 55-65). The international port of call Mantai (the ancient port Mahatittha), located in the Mannar Gulf opposite the ports of Alagankulam and Korkai in Tamil Nadu, helps inter-link Sri Lanka with India and also bridge the trading activities of the Southeast Asia and the West (Carswell and Prickett 1984). Likewise the port of Mahagama also yielded Rouletted Ware, Brahmi graffiti and Indo-Roman and punch marked coins (Parker 1909).

The available epigraphical and archaeological sources suggest that the traders played an active role in accelerating these cultural activities time and again. The view so far has been that the Brahmi script was introduced by the Mauryan emperor Ashoka along with Buddhism. Based on the Anuradhapura stratigraphical evidence, Allchin conceived that the Brahmi script began to be used in Sri Lanka a century before the start of Mauryan rule in Magadha and these were introduced by the mercantile community at least in 4-5th century B.C. As per his assumption, the Sri Lankans, particularly the trading communities are aware of the Brahmi script even before the introduction of Buddhism in Sri Lanka. This script was later adopted for writing the religious texts so the whole gamut of Prakrit inscriptions is later in date. He draws the attention of the series of non-scriptural marks. Even if one leaves the date aside, there is no denying fact that the trade community played a greater role in introducing the script and language (Allchin 1995: 209-210). In Tamil Nadu too, it is widely felt that the Brahmi script was introduced or developed by the traders particularly the followers of Jainism. Considering their geographical proximity, the absence of Prakrit inscription of Sri Lankan origin in the Indian mainland is quite surprising. However, the recent study of Iravatam Mahadevan proves that Prakrit inscriptions of Sri Lankan origin are present at Arikamedu, Alagankulam, and Kodumanal in Tamil Nadu. The nine texts analysed by him show the diagnostic linguistic features like genitive suffixes — *sa/ha,* shortening of long vowels, de-aspiration of the aspirates and the unique change of *ja* to *jha.* These linguistic features are peculiar to Sri Lankan Brahmi (Mahadevan 1995: 55-65). The occurrence of these characters in Tamil Nadu particularly at the ports and trade centres suggest their frequent interaction. The socio-linguistic study of these inscriptions show the men and material involved in the maritime trade and it synchronizes well with the evidence of both the countries.

The Brahmi inscriptions of Sri Lanka gives names of the various boat types like *navai, toda* and *patake* (Paranavithana 1970: nos. 127, 149, 786, 792, 796, 1174) which had their counterparts with identical names like *navai, toni* and *pataku* in the Sangam Literature. As found at Alagankulam (Fig. 4b), an inscription of 1st-2nd century B.C. found at Tuvakala in Polanaruwa district had a figure of a ship engraved in front of the name Barata. Another

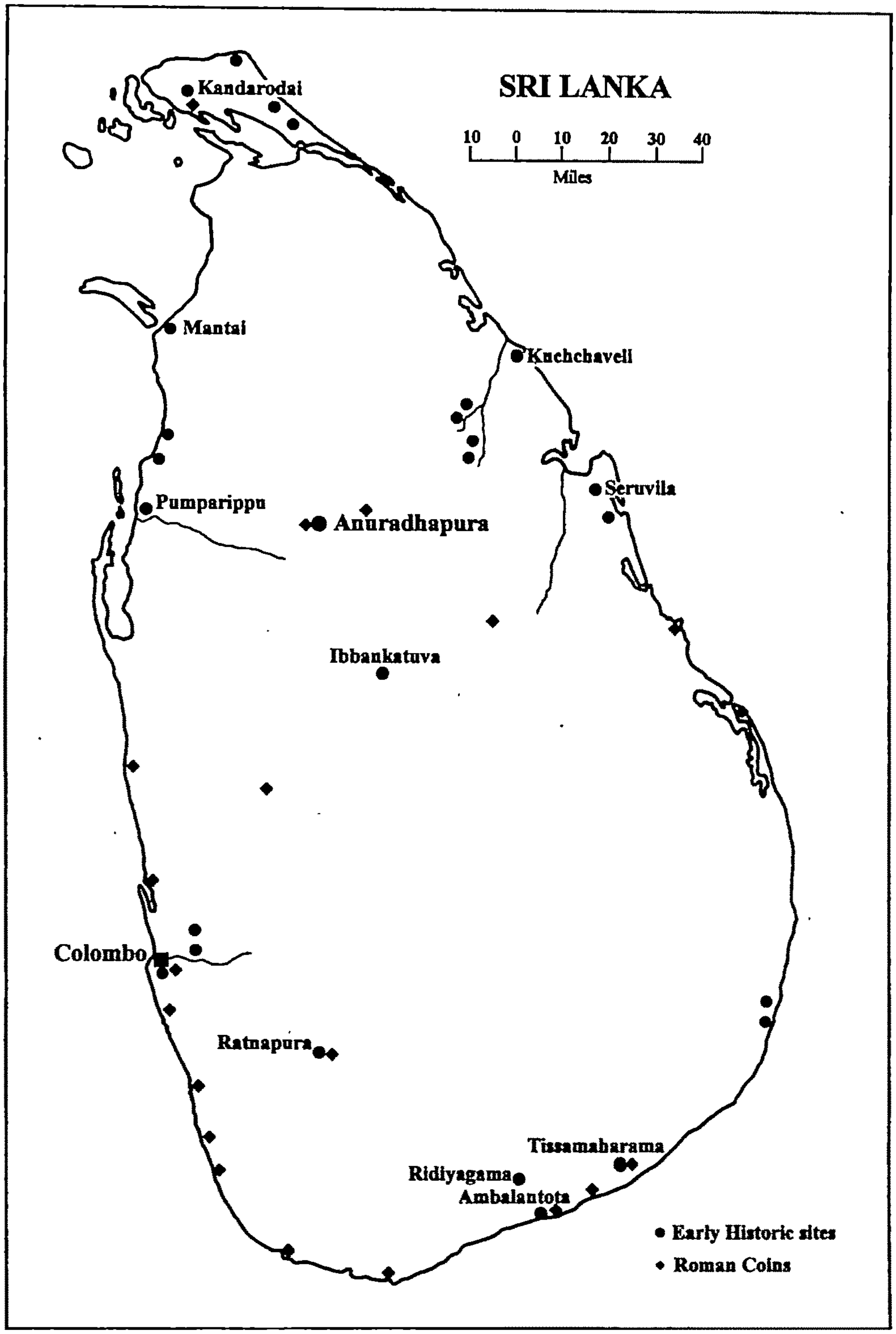


Fig. 5:Archaeological sites in Sri Lanka

ship motif engraved on a grey ware was brought to light from Anuradhapura (Coningham 1996: 92) (Fig. 4c).

The community *Barata* (*Paratavar* in Tamil Nadu) needs a special attention. The name Barata had its significance both in Tamil Nadu and Sri Lanka as they were chiefly involved in sea related activities like fishing, pearl and chank fishing and in trade particularly horse trading (Seneviratne 1985: 49-56; Maloney 1969: 224-240). Among them, the pearl fishery business would have become a lucrative business. The available epigraphical and literary records of Sri Lanka and India suggest that pearl fishing was done alternatively in two areas of Gulf of Mannar due to the migration of pearl oysters to opposite beds (Arunachalam 1952: 5) which necessitated the *barata* community moving freely into Sri Lankan waters.

Twenty-one Brahmi inscriptions of Sri Lanka bear the name *barata* (Pushparatnam 2001: 51). Of these twenty one, a name *tissa* is found in association with the word *barata* in 15 inscriptions. This shows that among the traders of *barata* community, *tissa* holds a special place in social status. Their closeness to sea is known from a coin collected from southern Sri Lanka inscribed with a name *barata tisaha* on the reverse and two fishes with swastika on the obverse (Bopearachchi and Wickremesinhe 1999: 53). These *barata tissa* served as a royal emissary, handled the ship as a captain and moved as big traders. A Brahmi inscription of Gurunakal refers to a captain of ship hailing from a Barata community who served as a royal emissary (Paranavithana 1970: 1049). Another ship captain named Tissa is referred to in Paramankanda and served as an ambassador. An inscription of 2nd century B.C. from Gudivila of Ambarai district referred to a Tamil trader called *tissa*, who made a *dàna* to a Buddha Sangha (Paranavithana 1970: 480). Likewise, the Anuradharapura inscription speaks about a meeting of the Tamil traders under the banner of a guild in which a trader named *tissa* is also involved (Paranavithana 1970: 94). Another interesting evidence is of a trader called *ila barata* mentioned in Anuradhapura inscription (Paranavithana 1970: 94) who carried out the trade in association with Tamil traders. The special mention of the *ila barata* (Barata of Ila i.e., Sri Lanka) is to differentiate from a *barata* (trader) of Tamil Nadu coast, though both hails from a same *barata* community. This barata community owned a ship and carried out their business by forming a guild. They also hold enviable positions in the society such as captain, ambassador and above all as a big traders. A Brahmi inscription of 2nd *c.* B.C. discovered at Anuradhapura informs us about the traders of Tamil Nadu engaged joint trade with *navika karava* and captain of the ship acted as a chief of the guild (Paranavithana 1970: no. 320). Another inscription of 1st century B.C. from the same place refers to a trader of Indian origin namely *navika* of *bojakata* (Paranavithana 1970: no. 99). The term *navika* is synonym with the *navikan* of Tamil Nadu mercantile community who own a ship. The father of Kannaki, the famous heroine of epic *Silappatikaram* is none other than a *manavikan*.

Two Brahmi inscriptions of Periyapuliyankulam in northern Sri Lanka mention a Tamil trader (*vanikan*) called *Visake*. The near identical name *visaki* is found on a Russet Coated Ware collected from a transepted cist burial with menhir at Kodumanal. The titles or the personal names like *samuda, samuta* and *camuta*, all meaning ocean, occurring in Sri Lankan Prakrit-Brahmi inscription (Paranavithana 1970: 123) is comparable with the *kadalan*, also meaning ocean, found in Tamil-Brahmi inscription at Mangulam near Madurai. The Alagarmalai Tamil-Brahmi inscription records a name *kalapan ilavarayan* in which, the scholars felt, *kalapan* (*kadalan*) stands for an ocean. So *kalapan ilavarayan* is a trader from Sri Lanka (Mahadevan 1966: 1-12).

In this context, the recently found inscribed coin reading "*mahacatan*" (Bopearachchi (1999: 54) read as *mahacita apo* is quite interesting. Here the word *catan* stands for a trader (*cattu* for a trade guild) and the prefix *maha* stands for big. The *mahacattan* is probably a big trader or a head of a trade guild involved in maritime trade and he probably issued the coin. The Tirupparankundram Tamil-Brahmi inscription mentions a *cattan* in association with a man called *Ilakudipikan*. Unlike in Sri Lanka, the coin issued by their counterparts *cattan* and *macattuvan* (*ma* = big, *cattan* = trader) of Tamil Nadu could not be found so far. All the inscribed coins so far unearthed belong to Tamil rulers. The Greek sea guide Periplus of the Erythraean Sea records that Roman traders procured the Sri Lankan goods without visiting that country and likewise Sri Lankan traders procured Roman goods from west coast ports of Tamil Nadu (Warmington 1928: 63). The literature *Pattinappalai* speaks of the imports from *Elam* (Sri Lanka) at Kaveripattinam and a householder of Sri Lanka *elakkudumbikan* made a stone bed for a Jain at Tirupprankundram.

The above evidence points to frequent voyages between the two neighbouring regions. The economically viable interaction played a causative role in the formation of ports, establishing a state, spread of literacy through the wide usage of Brahmi script and the exchange of technology in boat building, production of iron, glass beads etc. According to *Mahavamsa*, Sena and Gottika, the children of a captain of a ship involved in the horse trade, were the first Tamil rulers of Ceylon (177-155 B.C.) who came from Tamil Nadu (*Mahavamsa* XXI: 10) and subsequently Ellalan (Elara) established a long rule (145-101 B.C.) (*Mahavamsa* XXI: 15-34). There were frequent political contacts between Sri Lanka and South India during the Duttagamini rule (*Mahavamsa* XXXIII: 37-61).

The above discussion clearly indicates that multiple factors played a greater role in the trade based maritime contact between the Mediterranean and Southeast Asia and each factor has to be weighed in the given chronological and cultural frame.

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Beyond and Before the Imperial Frontiers: Early Historic Sri Lanka and the Origins of Indian Ocean Trade

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Abstract

On the eve of Partition, Sir Mortimer Wheeler published the findings of his wartime excavations at Arikamedu (Wheeler 1946, Wheeler *et al.* 1946). His report attracted great international interest as it included the first systematically recorded evidence of Roman artefacts in India. These artefacts enabled Wheeler to link the relative typologies of southern India with early European history, resulting in the creation of absolute chronologies for the region. In addition to Wheeler's chronological success at Arikamedu, his discoveries also allowed him to frame a model for the origins of Indian Ocean trade. This model suggested that Roman traders had acted as external stimuli to "leisurely and unenterprising" settlements on the Indian coast, transforming them into active trading stations (Wheeler 1955: 174). Reiterated in his well known book *Rome Beyond the Imperial Frontiers* (Wheeler 1955), this model has influenced much subsequent research in this area, leading one scholar to complain of the overstated role of Roman influence in the development of this trade (Whitehouse 1991). This paper will reassess the antiquity of Early Historic Indian Ocean trade, and the position of Graeco-Roman artefacts within its development, with reference to new evidence from the Sri Lankan–British excavations at the city of Anuradhapura (Coningham 1999, in press a).

Introduction

Between 1989 and 1994 a collaborative team of archaeologists excavated a 9.5 metre deep trench within the walls of the city of Anuradhapura, which is located in the North Central Province of Sri Lanka (Coningham 1999, in press a). The trench, termed Anuradhapura Salgaha Watta 2 (ASW2), measured ten metres or 30 feet square and was designed to obtain a chronometrically dated sequence of structures and a periodised catalogue of artefacts. Excavated according to the context system, its 1887 contexts, 515 postholes, 77 pits, 42 walls, 38 slots, 17 ovens and three wells have provided unique evidence for the development of an Early Historic city from its origins as an Iron Age settlement to its zenith as a medieval metropolis. Anuradhapura's success as a capital and centre is epitomised, not only by the vast complex of Buddhist monuments surrounding the city, but also by the presence of imported luxury goods from regions to the east and the west. Medieval trade with the former is represented by Egyptian and Persian glass vessels and kohl sticks, generally dating to between the ninth and tenth centuries A.D. (Coningham in press b) as well as by glazed ceramics. These ceramics include ninth century A.D. lustre ware from Iraq, ninth to thirteenth century A.D. lead glazed wares from Iraq or Iran, Sasanian-Islamic blue glazed wares as well numerous sherds of resin coated earthenware storage vessels (Canby *et al.* in press). These objects, of a western Asian provenance, closely link Anuradhapura with the site of Mantai on Sri Lanka's northwest coast (Carswell and Prickett 1984), Banbhore in the Indus delta (Khan 1964), Siraf on the Persian Gulf (Tampoe 1989) as well as Kilwa on the Tanzanian coast (Chittick 1974) and Fustat on the Nile delta (Pinder-Wilson and Scanlon 1973). Similarly strong trade links are found between Anuradhapura and eastern Asia in the form of glazed ceramics. These ceramics include ninth century A.D. Changsha painted stoneware from south-west China, ninth to tenth century Xing and Ding wares from Hebei province in northern China, ninth to tenth century A.D. Yue green wares from Zhejiang province in Southeast China and 8-12th century A.D. Chinese or north Vietnamese coarse grey stone ware (Canby *et al.* in press). Moreover, this unbroken sequence of over two millennia has provided a unique perspective on the development of local, regional and international trade networks which linked Anuradhapura with its hinterland, the island's coast as well as with other Indian Ocean settlements (Fig. 1.).

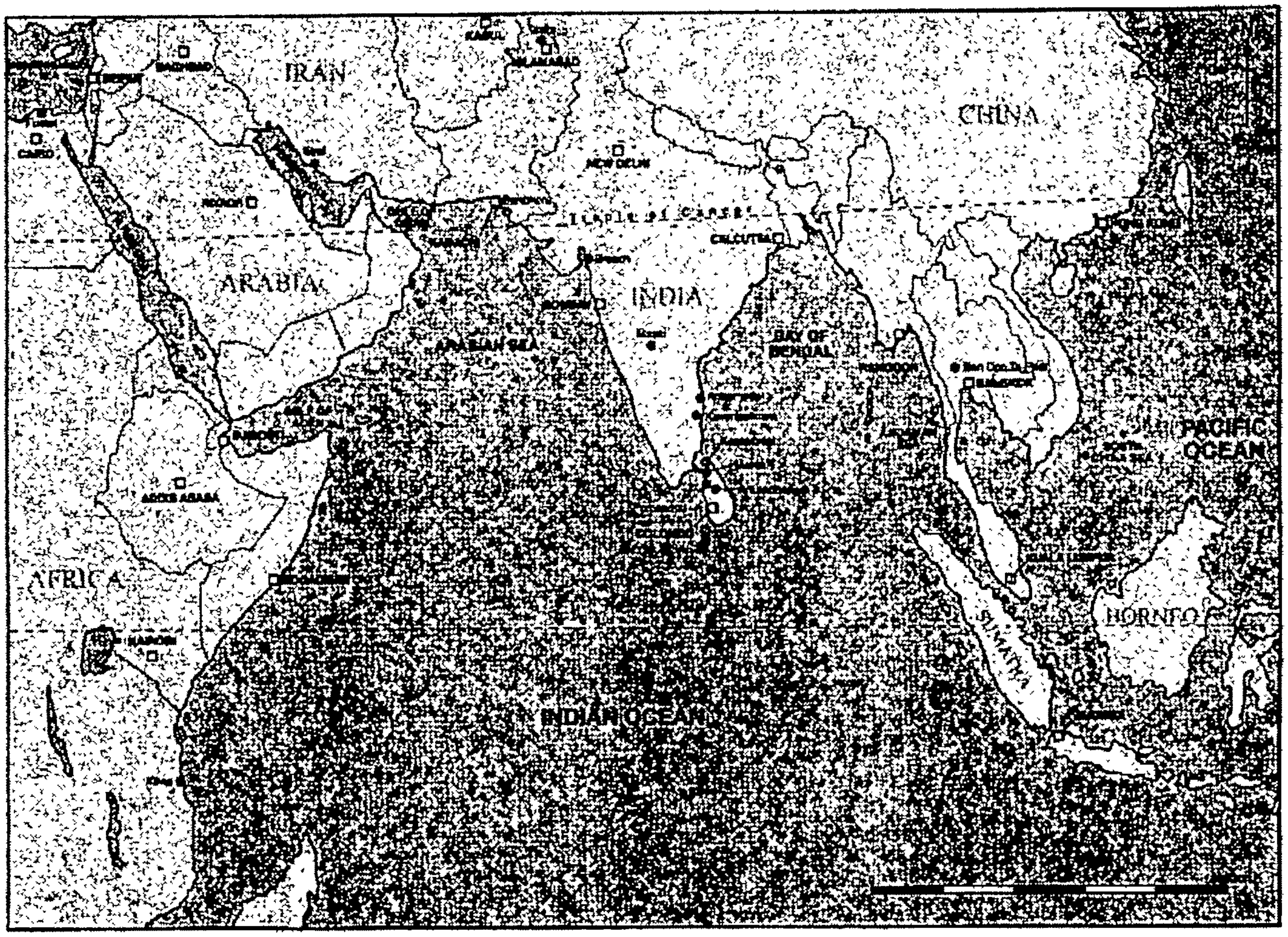

Fig. 1: Map of the Indian Ocean region showing the location of sites mentioned in the text

Rome beyond the imperial frontiers: the position of Indo-Roman trade

In 1946 Sir Mortimer Wheeler published the first systematically recovered evidence of Roman trade with the Indian subcontinent in a report entitled '*Arikamedu: an Indo-Roman Trading Station on the East Coast of India*' (Wheeler *et al.* 1946). Alerted to the site by the presence of Roman material collected by local antiquarians, Wheeler excavated at Arikamedu in 1945 in order to link the relative sequences of southern India with absolute dates. Dates and evidence of Roman trade were subsequently provided by the recovery of 40 sherds of Italian Arretine pottery, 116 sherds of imported Mediterranean amphorae, part of a Roman ceramic lamp and two fragments of Roman glass bowls from Wheeler's excavations. Under a section entitled 'wares imported from the Mediterranean', Wheeler also included a ceramic known as Arikamedu Type 1 or Rouletted black ware. Whilst acknowledging that the decoration was "not an Indian feature and may be regarded as an importation from the Mediterranean region" (Wheeler *et al.* 1946: 45), he was uncertain of the type's provenance (Wheeler *et al.* 1946: 34) stating that "whether actually imported or not, (it) shows foreign influence". This material suggested to Wheeler a date range of between the end of the first century B.C. and A.D. 200 (Wheeler *et al.* 1946: 24). Although the earliest occupation was ephemeral, Wheeler identified the construction of a number of major industrial complexes, including a 46m long brick-built 'warehouse' and brick-lined tanks for textile processing, during the subsequent period which he termed 'the Arretine period' (c. 50-100 A.D.).

When interpreting the presence of such exotic goods and monumental buildings at the site, Wheeler interpreted the site as a 'Roman market on the Coromandel coast' and 'an Indo-Roman trading-station' (Wheeler *et al.* 1946: 17). Furthermore, he was drawn by analogies with the European trading companies in India, stating that 'this trade was organised on lines not unlike those of the European 'factories' established in India from the sixteenth century onwards' (Wheeler *et al.* 1946: 18). He further developed this model suggesting that 'permanent lodges of western traders were settled under formal agreements with the appropriate Indian ruler, and were visited at the proper seasons by convoys of deep-sea merchantmen. And just as the agents of the Portuguese, Dutch, Danish, French or British establishments in the days of the companies travelled widely in the interior to circumvent the middlemen' (Wheeler *et* al. 1946: 19). Wheeler's initial model was later reiterated in his highly influential study of the nature and development of Roman contact with south Asia — *Rome beyond the imperial frontiers* (Wheeler 1955). In this book, Wheeler surveyed the evidence for Roman contact, both literary and materially, with states and regions outside the empire, including Asia. Starting with the accounts of first century A.D. maritime travel, the Periplus of the Erythraean Sea, he matched its descriptions and names of regions, cities and ports with archaeological and historical sites. Thus Barygaza was matched with Broach, Kalliena with Kalyana, Podouke and Arikamedu with Pondicherry and Khaberis Emporium with Kaveripatnam (Wheeler 1955: 145). Wheeler then stressed the importance of Hippalus' discovery of the nature of the monsoon winds, and its regularisation of Indian Ocean trade during the reign of Augustus (Wheeler 1955: 157). Indeed, his support of the Roman discovery of Indian Ocean trade routes is encapsulated within his introductory statement that 'The Roman traders and their agents were venturesome folk' (Wheeler 1955: 18). The role of south Asia within this development is also made quite clear with arguments that Roman coinage in India was merely a source of bullion (Wheeler 1955: 167) and that Arikamedu was only a small 'leisurely and unenterprising' fishing village before it developed into a brick-built town through contact with foreign traders (Wheeler 1955: 174-5). Indeed, the only reference to indigenous rulers and traders given by Wheeler is limited to a comment that trade at Barygaza was obstructed by a local ruler and the presence of pirates (Wheeler 1955: 147).

Rome beyond the imperial frontiers: the evidence of Roman trade at Anuradhapura

The collaborative Sri Lankan-British excavations at Anuradhapura identified clear evidence of Wheeler's hypothesis of Roman contact in the form of artefactual material (Fig. 2). This material was mainly recovered from trench ASW2's Structural Period G which consisted of five phases of structural activities and has been dated to between the first quarter of the third century cal. B.C. and the latter half of the first century cal. A.D. (Coningham 1999). The sequence of G consisted of a series of superimposed rectangular structures following similar architectural patterns (Fig. 3). One of the best-preserved phases was G2 which consisted of a partially exposed building foundation (615) in the northern half of the trench measuring over 9 m long and over 4.5 m wide. The foundation was defined by slot trenches and it was possible to identify the location of at least two interior pillar support foundations. The two foundations, contexts 669 and 612, measured 2 m^2 and contained fills of limestone slabs, sand and pebbles. It is assumed that they supported timber uprights for the roof and that they present one of the earlier experiments, which presaged the technology necessary for the ashlar architecture of the Anuradhapura period. A further building foundation (616), presumably connected, was identified in the southeast quadrant of the trench complete with wall slot trench and pillar foundation (596). Whilst little evidence of brick-built structures was recovered from the earlier phases, an extremely well preserved brick-built complex was identified in the final phase of structural period G. This phase consisted of a brick paved area of some 24 square metres defined on the west by a brick wall and cut by three conical bottomed ceramic vessels with diameters of over 0.70 metres. The paved area was defined on the east by a range of cells laid out within two parallel 10 metres long walls. These walls had been constructed of a timber stake framework and coated with mud-mortar and whitewash and then covered by a rood of kiln-fired tiles.

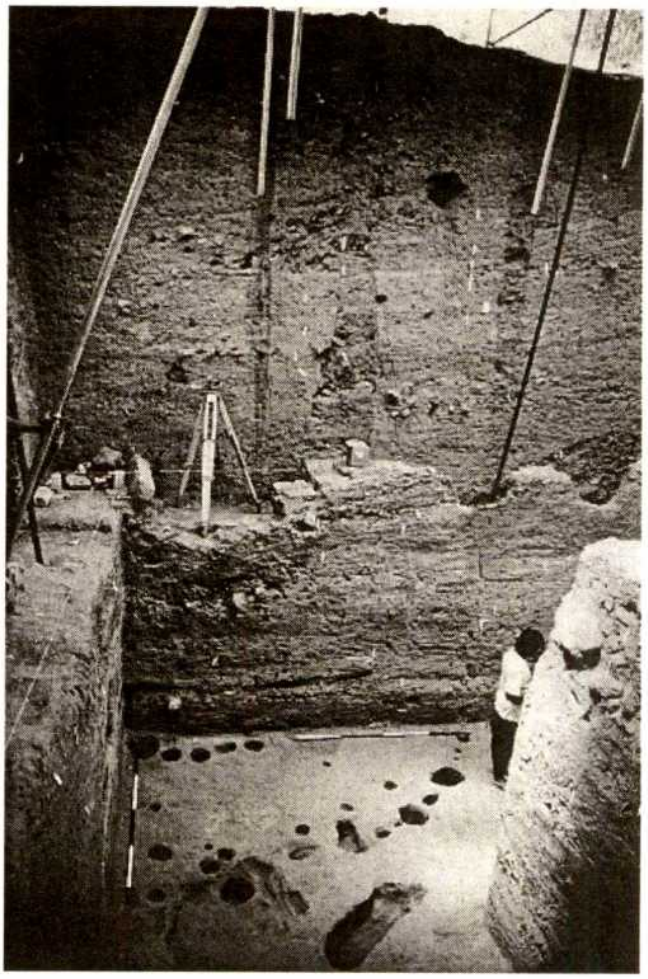

Fig. 2: Trench ASW2 at Anuradhapura

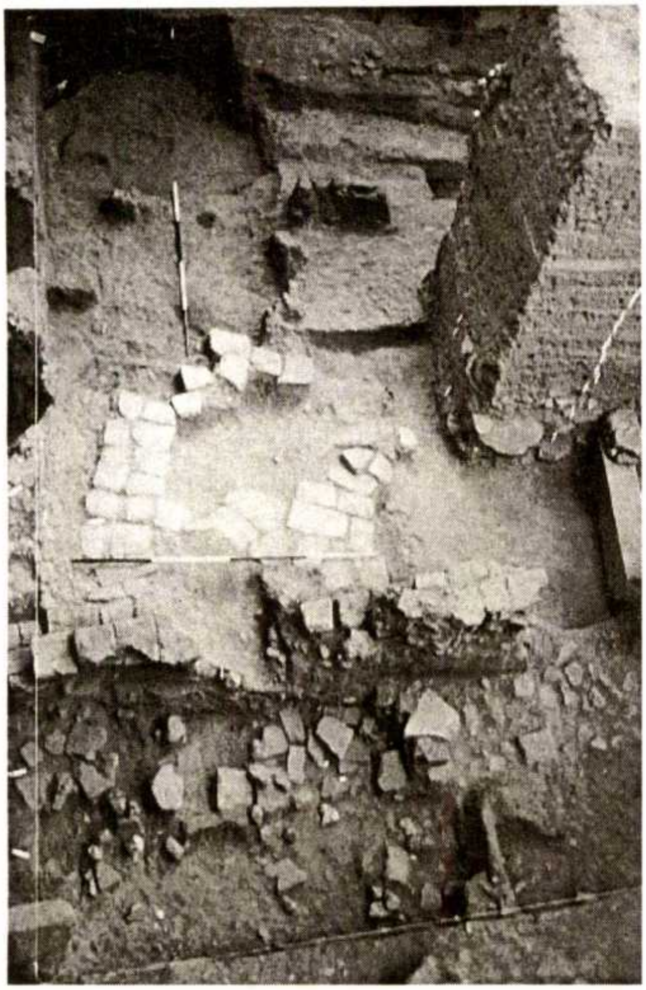

Fig. 3: Buildings of structural phase G5

Although it may be tempting to seek analogies between the materials and architecture of Arikamedu and Anuradhapura, the former has been typified by monumental, commercial structures (Wheeler *et al.* 1946), and the latter by a sequence of a domestic nature — albeit the sample is small.

Whilst structural analogies may be more difficult to prove, artefactual analogies are quite clear with a large number of categories shared between the two sites. Five sherds of Eastern Mediterranean glass were recovered from trench ASW2, all of which have been dated to between the first century B.C. and first century A.D. and form part of the late Hellenistic and early Roman category of colourless and coloured, grooved bowls (sfs 6716, 1097, 5306, 5689 and 6281). Of the five, three in structural period G were 'in situ', whilst the others are thought to have been redistributed by later robber pitting. It is also apparent that the horizontal wheel-cut grooved decoration is similar to that found on the fine ceramic form known as Arikamedu type 10 (Coningham in press b). Metalwork similarly indicates a number of connections with the Greco-Roman world with the presence of five Roman coins, albeit identified in structural period F and the period of robber pitting (sfs 221, 5144, 677, 713 and 405). All are late Roman imperial third brass, and the least worn indicates that it was minted in Antioch (Bopearachchi in press). Other examples include a copper alloy mirror fragment (sf. 15086) formed by a rounded bar joined onto the back of a rounded sheet, and fragments of a copper alloy bowl (sf. 16159) with a laurel leaf decoration on the rim, both recovered from structural period G (Coningham and Harrison in press). In addition, indirect evidence may be found in the presence of iron tweezers (sf. 17203) and saw blades (sfs 8259, 25001, 15063) which Marshall (1951) believed to share strong Graeco-Roman affinities. These artefacts are supplemented by ceramic forms, which also indicate contacts with the Graeco-Roman world, in particular Rouletted ware or Arikamedu Type 1, Arikamedu Type 10 and Arikamedu Type 18. Whilst Wheeler referred to the former as a ware imported from the Mediterranean, he classified the Types 10 and 18 as local. In addition, new forms from Anuradhapura have also been attributed to a Mediterranean source, namely Anuradhapura Types 21a(i), 23a(i) and 24a(i) (Bouzak and Deraniyagala 1985). Bases with a central boss or protrusion (omphallus ware) were also encountered in G2, G3 and G5 (sfs 10006, 8143, 6940, 6997, 6599 and 8235). Similar sherds from Arikamedu have been recognised by Begley (1991: 183) who has identified in them contact with the classical world. These formal analogies notwithstanding, scientific analysis, both thin-section and Inductively Coupled Plasma Emission Spectroscopy (ICP ES), has suggested that Anuradhapura type 24a, noted above as omphallus ware, shares the same provenance as Rouletted ware and Arikamedu Type 10 (Krishnan and Coningham 1997, Ford 2000; Ford *et al.* In Preparation). However, the Graeco-Roman analogies are still strong regardless of whether one identifies a Roman or slightly earlier Hellenistic origin for elements of the decoration (Begley 1987). In addition, the recovery of four small sherds with a turquoise glaze (sfs 8590, 2378, 6923 and 7091) in structural phase G5, may indicate contact with the Parthian world, whether from within Iran itself or via contacts with Gandhara where similar sherds have been found (Marshall 1951: 406).

Before the imperial frontiers: the evidence of pre-Roman trade at Anuradhapura

That Wheeler's model (Wheeler *et al.* 1946, Wheeler 1955), and that of Casal (1949), had underestimated the antiquity of the settlement at Arikamedu was quickly noted by Raymond Allchin who stressed the importance of the sequence below Roman contact and its links with the Iron Age tradition of peninsular India (Allchin 1957). This suggestion has more recently been developed by Begley who has suggested dates as early as the second century

B.C. for the development of the site (Begley 1983). Similarly, Deraniyagala (1986) has advocated an earlier date range for Rouletted ware and shifted from Wheeler's suggested range of between 0 and 200 A.D. to a range of between 200 B.C. and 200 A.D. on the basis of radiocarbon dating from his excavations at Anuradhapura. Pushing back the dates for Arikamedu, Begley has furthered her hypothesis by seeking evidence of what she terms 'pre-Periplus' trade on the Indian coast, that is Hellenistic trade. Studying the distribution and date of mould-made and rouletted wares, the influence of Hellenistic metal and ceramic prototypes is advocated for the genesis of both (Begley 1991). Thus, whilst Begley has extended the dating of such wares to the second century A.D., she appears firmly committed to the role of classical trade as indicated with the preoccupation of identifying 'western' classical influences. This preoccupation with the identification of 'pre-Periplus' and Roman trade, as illustrated by the contributions to *Rome and India* (Begley and de Puma 1991), has undoubtedly led to the understating of the presence and contribution of indigenous traders and their settlements in the development of Indian Ocean trade. Indeed, it is clear that competent maritime trade systems must have been in place in order to transport etched carnelian beads to Southeast Asia where they have been found at the site of Ban Don Ta Phet in contexts dating to the fourth century B.C. prior to both Roman and Classical trade (Glover 1990). Support for the presence of such a trade network around the coast of India is provided within Lahiri's study of the archaeology of Indian trade routes (Lahiri 1992), in which she identified sources of raw materials and tentative routes for their dispersal within the Subcontinent.

It may therefore be hypothesised that regardless of the recent shifts in date of Rouletted ware and the presence of pre-Periplus classical trade contacts, routes and networks were already well established before the first Greco-Roman contact with such regions. The actual evidence for such networks may again be cited from the formidable sequence at Anuradhapura and its Structural Periods J and I. Period J is dated to between c. 510 and 340 cal. B.C. and has strong affinities with Iron Age cultural traditions of peninsular India (Coningham 1999). Indeed, its structural sequence is dominated by a sequence of five phases of round buildings and circular pit 1472 appears very similar in form and content with the Iron Age burials of Maski and Pomparippu (Thapar 1957; Begley 1981) (Fig. 4). Structural Period I, by contrast, represents a major change within the sequence with the first appearance of rectangular structures at trench ASW2 (Coningham 1999). Dating to between c. 360 and 190 cal. B.C., the Period consists of eight phases of cardinally orientated rectangular buildings defined by lines of postholes and roofed with ceramic tiles (Fig. 5). Study of the city's fortification sequence suggests that the 60 ha settlement was enclosed for the first time during Period I with the construction of a cardinally-orientated rampart and ditch (Coningham 1999). Whilst Structural Period J's cultural affinities are strongly with the

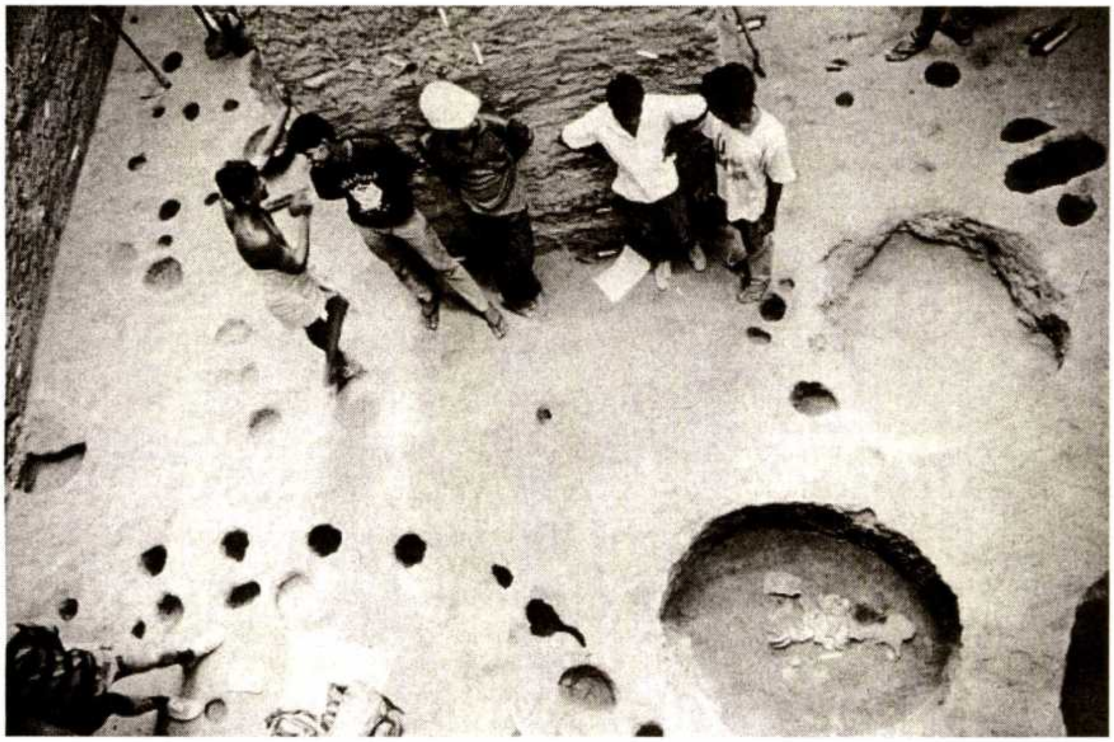

Fig. 4: Buildings of structural phase J4

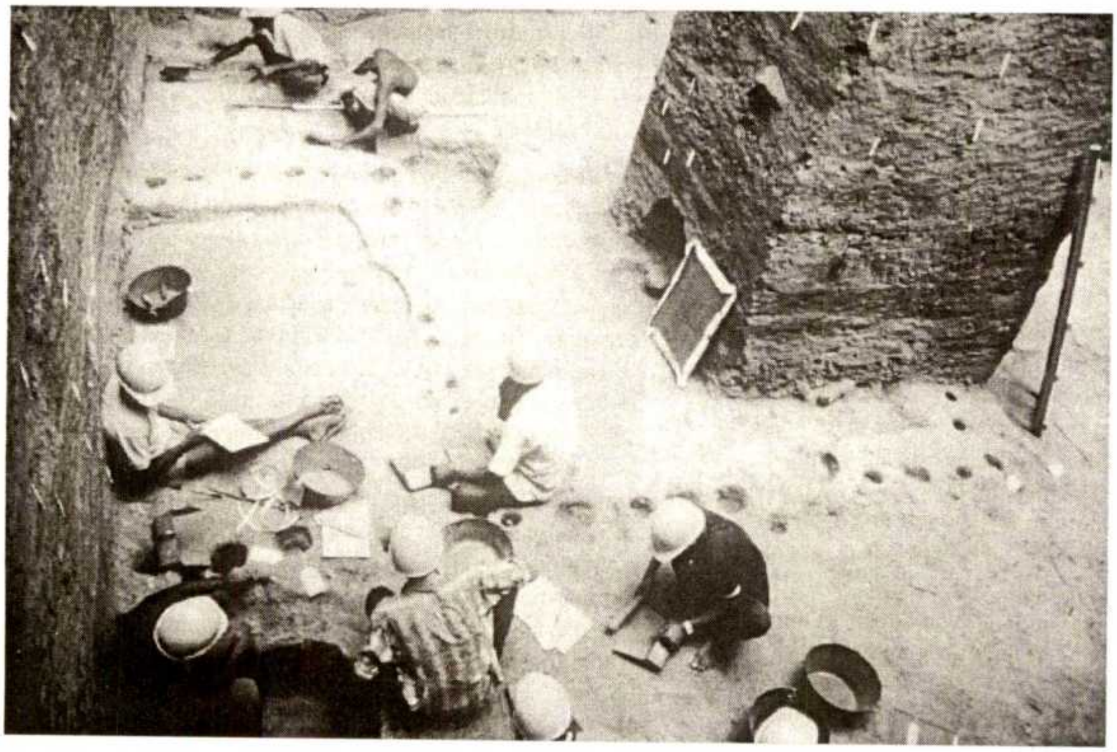

Fig. 5: Buildings of structural phase I4

Iron Age traditions of peninsular India, those of Period I are much wider. The earliest presence of maritime links is found in Structural Period J and is represented by two carnelian beads from J5. These two beads, and others examples including debitage from Structural Period I, may be presumed to come from the Deccan traps of western India although it is acknowledged that there are sources in peninsular India (Krishnan 1982). Also from Structural Period I are two beads of lapis lazuli further identifying maritime trade from possible sources in Afghanistan, Baluchistan or the Aravalli Range (Kenoyer 1998). A single sherd of Northern Black Polished ware was recovered from phase I7 and represents evidence of the maritime trade in ceramics. Finally, the presence of horse bones and teeth from phase I1 onwards further proves that strong enough maritime links had been established to facilitate the movement of not just artefacts but also livestock as well. This evidence is not limited to the site of Anuradhapura but is also evident within the north central plains of Sri Lanka. Finds of imported etched carnelian beads, for example, have been recovered from within the Iron Age 'megalithic' cemetery at Ibbankatuva, which has been dated to between the seventh and fourth centuries B.C. (Deraniyagala 1992). Such evidence links Anuradhapura and the island of Sri Lanka more widely into the maritime trade networks which must have encompassed the entire subcontinent by the middle of the first millennium B.C.

The nature of indigenous Indian Ocean trade: a conclusion

Nayanjot Lahiri's 1992 study of trade routes, noted above, also examined evidence for the existence of localised networks distributing raw materials and finished goods within the subcontinent, stressing the equal importance of internal trade. Indeed, this aspect has tended to be rather overlooked by scholars searching for evidence of Roman or classical contact in south Asia. Such scholars, Wheeler most notably, have historically appeared to subscribe to a somewhat simple model based on the gross characteristics of sixteenth and seventeenth century European trade with south Asia as already outlined in section 2. It should be recognised, however, that the foundations of such models are being re-evaluated in the light of increasing evidence of the economic importance of European participation within 'country trade', or rather inter-regional, maritime trade (Chaudhuri 1985: 90). Indeed, documentary evidence for European inter-regional Indian trade is now augmented by material evidence from studies of Dutch shipwrecks off the coast of Sri Lanka. The 1659 wreck of the *Avondster*, for example, has recently yielded evidence of an aspect of this trade in the form of preserved organic materials - areca nuts. The ship's cargo of areca nuts, also incorrectly known as betel, was harvested in the island of Sri Lanka and loaded for markets on the Indian mainland (Rukshan Jayewardene personal communication). Such evidence stresses the danger of relying upon models based on inventories of non-organic artefacts solely as the rich corpus of organic trade materials is unlikely to have survived. Indeed, the few tantalising organic finds from Arikamedu, coconut and palmyra (Chowdhury and Ghosh 1946), may indicate a highly significant export within the region — one largely overlooked. The importance of such local and inter-regional networks, both maritime and terrestrial, may be stressed by once more examining the sequence at Anuradhapura, as it is an inland site unlike the well-known site of Arikamedu or even the historical Sri Lankan port site of Mantai (Coningham and Allchin 1995).

The evidence for Anuradhapura's contact and trade with local maritime communities, either on the coasts of Sri Lanka or overseas, consists mainly of the presence of maritime species within the excavation's archaeozoological and archaeobotanical catalogues. This evidence includes four fragments of marine turtle carapaces, from Structural Periods I and J, possibly recovered from nesting sites on the island's beaches as well as the presence of marine shells. The latter include marine bivalves recovered from Period I; *Lamellaria* sp. (marine gastropod) from J and I; *Oliva* sp. (marine gastropod) from J and I; *Strombus* sp. (conch) from J and I; and, finally, *Turbinella* sp. (marine gastropod) from I (Young *et al.* in press). Further evidence of links with the coastal regions has been found in the presence of wood charcoals from *Lumnitzera racemosa* in Structural Period I (Young and Coningham in press). This discovery is highly significant as *Lumnitzera racemosa* belongs to the Combretraceae family, which is dominant in some mangrove swamps and can only tolerate brackish water and its closest suitable environment to Anuradhapura is on the island's west coast, some 100 km away. This material must be presented alongside the evidence for the early development of a series of trade networks within the island linking Anuradhapura to areas of raw resources. For example, ferrous diagnostic slag and residues were found in every Structural Phase from Period K onwards, but the sequence indicated no evidence of smelting on site. This evidence suggests that such activities were carried out elsewhere in the city's hinterland and that prepared billets of iron brought into the site for smithing into artefacts (McDonnell, Russell and Coningham in press). Similarly, there is evidence that inland communication and trade networks were bringing semi-precious stone materials into the city. Whilst complete objects of quartz were recovered from J and I, debitage from bead working was encountered in Periods J and I with an unfinished bead blank in I. Blanks of garnet, a stone common within the highland series of north central Sri Lanka (Cooray 1984), were also recovered from I and debitage from bead working in J and I and amethyst debitage from the latter. This collective evidence presents Anuradhapura at the heart of a series of linked local, island-wide and inter-regional trade networks.

Further evidence of the complexity and antiquity of these networks is provided by the presence of sherds of a fine to medium grey ware in the sequence at Anuradhapura. This grey ware is closely connected to Rouletted ware in terms of shape and, indeed, is thought to be ancestral to Rouletted ware (Deraniyagala 1992: 712, Coningham and Allchin 1992: 163). Whilst Prickett-Fernando (1990) has suggested that this is an import from northern India, scientific analysis has further demonstrated that this suggestion is incorrect as in terms of mineralogy and clay paste preparation technique the two wares are almost identical (Krishnan and Coningham 1995, Ford 2000, Ford *et al.* In Preparation). Represented by 228 sherds, the earliest phase in which they are found is J1, which dated to c. 510 cal. B.C. It is notable that this ware is also present at Kantarodai in the Jaffna Peninsula, in levels dated to between c. 480-130 cal. B.C., as well as from Arikamedu (Coningham and Allchin 1992, Wheeler *et al.* 1946) - anticipating the success of Rouletted ware and, perhaps, indicating strong inter-regional cultural and trade linkage. Reference should also be made to the presence of four sherds bearing portions of Early Brahmi inscriptions (sf 17308, 17425, 17332 and 17330) from Structural Period J. Firmly establishing further maritime links with northern India, their presence at this early date also reflects the explosive demand for systems of recording and ownership as long distance trade, and its economic risks, increased (Coningham *et al.* 1996). We should also note the presence of a flat-bottomed bowl of grey ware (sf. 10548) complete with incised outline of what is probably an ocean-going vessel from phase I3 at Anuradhapura. Complete with high prow, single mast with rigging and twin rudder oars, it further underlines the webs of networks, both maritime and terrestrial which met at the inland site of Anuradhapura (Fig. 6). Finally, it should be noted that Anuradhapura's patterns of craft-activity and manufacture, established in the beginning of the first millennium B.C., continued largely unaltered until the eleventh century A.D. when the site is abandoned (Coningham in press a). This continuity severely reduces the impact of Greco-Roman trade within the region and confirms its internal economic genesis and stability. However, if we are fully to understand the antiquity and origins of Indian Ocean trade, we must study the development of local and inter-regional networks in parallel with exotic ones, and ensure that the guiding models selected are informed by the most recent scholarship available. In conclusion, we can fully support Whitehouse's warning that 'Roman ships from Egypt were a presence in the western Indian Ocean in the first century or so A.D. However, there is a danger of overstating their role in the maritime trade of the region' (Whitehouse 1991: 218).

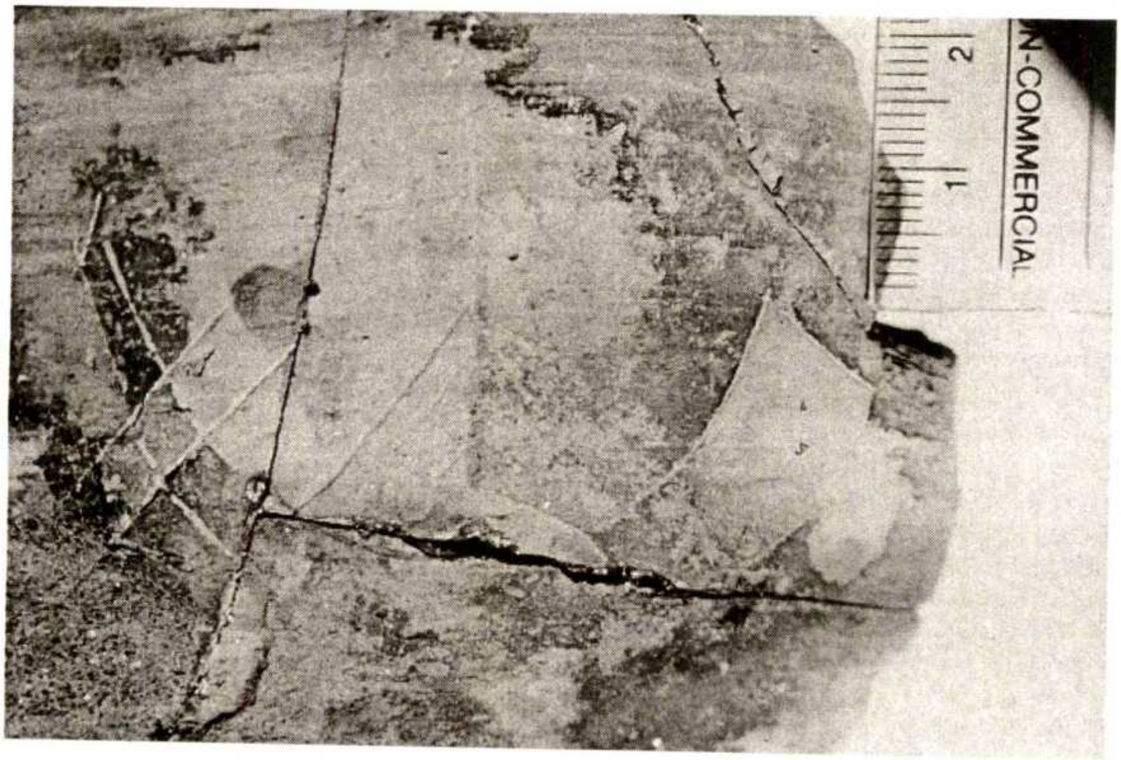

Fig. 6: Incised outline of a ocean going vessel on a grey ware bowl from structural phase I3 (Sf 10548)

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Pre-Islamic Maldives

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Abstract

Maldives is a small country, a double string of coral islands, none of which are very large. Nevertheless, in spite of its small size, the country has been populated for well over 2000 years. With research and archaeological excavations, the ancient history of the islands is at last coming to light.

The language of the Maldives, Dhivehi, is of Indic origin, the people are of different ethnicities, perhaps because of the strategic position of the islands, almost in the centre of the most travelled routes in the Indian Ocean. Ships called at the Maldives, stopping over during the stormy days of the monsoon, on their way to the East and on the return journey. Trading ships also called at the islands, bartering their goods for cowries, ambergris, tortoise shells, fish and coir rope. Some of the industries of the islands were fishing, rope-making, weaving, boat building and coconut cultivation.

Maldives converted to Islam in 1153 A.D. Recent archaeological evidence proves that until the advent of Islam, the Buddhist religion had existed in the country. Buddhist relics and ruins of monasteries have been found in many islands. Additional evidence of a Buddhist past was found in late 12th century copperplate grants, translated in the 1980's.

The islands had their own customs and culture. Ruled by their kings and queens for many centuries, the islands seem to have remained an independent kingdom through most of its known history. Maldives had its own system of rule, which seemed to have been suitable to the geographical setting of this unique archipelago.

Mention of islands identifiable as Maldives were made in ancient Buddhist texts of India and Sri Lanka. Roman and Greek writers, and in later centuries, Chinese, Arab and Persian records also mention the Maldives. These records reveal that the ancient Maldivians were seafarers and travelled long distances, to Rome, China, and perhaps other distant countries for which no records now exist.

More extensive research, including scientific excavation of archaeological sites, will help us gain a clearer picture of the country's pre-Islamic past.

Introduction

The Maldives are said to be little known, even "unheard of" by many writers, perhaps because of their insignificant size and because the islands did not possess the mineral or agricultural wealth desired by the medieval world. However, the islands have been populated for over two thousand years, as shown by recent archaeological excavations. Due to the climatic conditions, the heat and humidity, which do not make for the long survival of artefacts, and the fact that most artefacts produced in the islands have of necessity been made of non-durable materials, there is little to show as evidence of the nation's long history. The fact that the Maldives did not come to the attention of the better-known countries of the medieval world preserved the country's anonymity for hundreds of years.

In recent years efforts have been made to bring at least some of this history to light, through archaeological and historical research and linguistic studies. Archaeological evidence as well as copperplate records led to the discovery of the country's Buddhist past during the pre-Islamic period. Research into the cowrie shell trade, has shown that these islands had supplied cowries to many of the countries bordering the Indian Ocean and countries further afield (Heimann 1980:48). Excavations have revealed that there was a constant trade with Chinese vessels, which called at the Maldives on their way to trade with the countries of the Middle East. These facts become self evident when the strategic position of the Maldives in the Indian Ocean is taken into context. The Indian Ocean was reputed to be the most travelled ocean in the ancient world, and therefore the islands which lie in its central position is an easy port of call for food and water besides being a safe harbour during the monsoons.

There are few sources of information about the pre-Islamic period of Maldives. Available information indicates that there was "a matriarchal society, with myths and magico-religious beliefs, a system of class distinctions instead of the caste system" in existence in many other South Asian countries, a king who was a father figure and whose power was supreme, and a ruling system, "which was guided by time honoured customs and traditions"(Maniku 1993: 39).

Copperplate Grants from the 12th Century A.D.

According to available historical sources, the islands converted to Islam in 1153 A.D., during the reign of King Tribhuvana Aaditya of the Theemuge Dynasty. The oldest and most accurate Divehi records are copperplate grants from the late 12th century known as *loamaafaanu*. Some of these copperplate grants were first translated into modern Divehi and English in 1922, and more comprehensive translations of two of these grants were made in 1982 and 1986. These translations opened up a whole new area for research on the ancient history and customs of the people of the Maldives.

The copperplate grants, or *loamaafaanu*, of the 12th century records the names of the kings of the late pre-Islamic period, and also casts some light on the system of government and way of life that existed in the country at the time. The script and the language of these *loamaafaanu* take us back more than eight hundred years and give us an idea of the older Divehi language, before the changes brought about by the influence of Persian, Arabic and European languages. The *loamaafaanu* usually gave the name and lineage of the king who built the mosque, the circumstances in which the mosque was built, and other important information regarding the location and also, the names of the witnesses to the grant.

In 1982 and 1986 the two oldest of the existing *loamaafaanu* copperplate grants were translated. These *loamaafaanu* are specifically records of official grants given by the ruling king to individual mosques, bestowing on them the benefits from various islands for their expenditure and upkeep. One of these grants, the Isdhoo *loamaafaanu* was written in 1195 and the other, the Dhan'bidhoo *loamaafaanu* in 1196 A.D. These dates were 42 and 43 years respectively, after the official conversion of Maldives to Islam, but the incidents recorded in both *loamaafaanu* show that the mosques in the two islands, Isdhoo and Dhan'bidhoo were built immediately after their conversion (Wijeyawardhana and Dissanayaka 1982, Maniku and Wijeyawardhana 1986). This places the dates of their conversion at 1195 and 1196 A.D., and reveals the fact that although Maldives had officially converted to Islam in 1153 A.D., all the islands did not embrace the religion at the same time. Due to the distances and difficulties of travel within the atolls, conversion of the entire country took much longer, and until then the existing customs prevailed. Since these copperplates were inscribed soon after the conversion, most of the customs and system of government of the earlier days remained unchanged at the time of writing, and therefore, we have a reliable record of some of the culture and customs that existed at the end of the Buddhist period in Maldives.

The Dan'bidhoo *loamaafaanu* (Fig. 1.) is written in the Eveyla script in old Dhivehi, and describes the conversion of the island of Dhan'bidhoo by Sri Gadanaaditya, the reigning king of the Theemuge Dynasty. He is said to have converted the inhabitants of the island, destroyed the monastery, and in its place, built a mosque, naming it the Juma Masjidu (Friday Mosque). The community of monks in the island was disbanded, the chief clans of the island were identified and groups were formed to carry out Government duties. Generous concessions were made to the poor of the island. Noteworthy is the fact that the ruler had accurate information regarding the islands of the kingdom mentioned in the grant. Donations to this mosque were to be given from some of the land in Male' as well (Wijeyawardhana and Dissanayake 1982; Najeeb 2001), showing that even during ancient times, the principal island of the country had responsibilities towards distant islands of the kingdom.

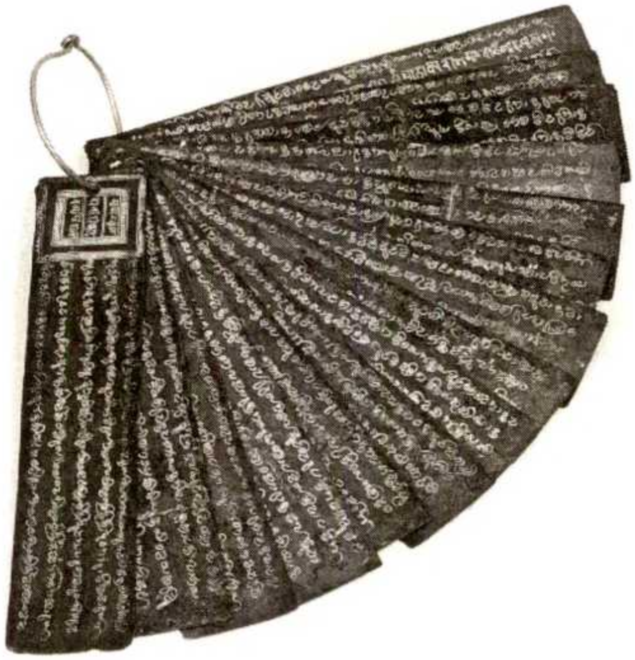

Fig. 1: Dhan'bidhoo Loamaafaanu, a copperplate grant written in 1196 A.D.

Isdhoo *loamaafaanu* written in 1195 A.D., also in the Eveyla script, was translated in 1986, and gives more information on existing customs. A description is given on how a dwelling for one of the eminent families of the island should be constructed, including instructions to cover the walls with Chinese silk (Maniku and Wijayawardhana 1986: 23). This account is evidence of the fact that Chinese silk was a familiar commodity, giving rise to the assumption that Chinese trading ships stopped at Maldives on their way to the Middle East, exchanging their silks and other goods for the commodities they needed through the common barter system. Other indications of the Chinese trade, lies in the fact that shards of Chinese pottery dating to between the 9th and 19th centuries were found in Maldives (Carswell 1996: 505).

The copperplates also reveal that the rulers in the capital of Male' were aware of developments in other islands, even though travel between islands was difficult and time consuming. The witnesses to the grant were ministers of the king; among the titles of these ministers are some that existed until the mid-twentieth century. There was also a system of land grant to families. These properties remained in families for generations, within a matrilineal system of inheritance.

Information from Foreign Sources

There are some early sources of information, which may be referred to, that could also shed light on pre-Islamic Maldives. The earliest mention of the Maldives, is in ancient Buddhist Jatakas and in Sri Lankan texts, which refer to events that occurred between 300-250 B.C. A reference in the Mahavansa indicates the arrival of a group of exiles in the Maldives around the period 300 B.C., at the same time as another group arrived in Sri Lanka. These two groups are said to have come from the same place of origin in western India (Maloney 1980). This could accommodate the hypothesis that Divehi and Sinhalese separated from the same Prakrit (Cain 2000: 3), which itself could have evolved in India.

The next mention of Maldives occurs in records of Roman and Greek writers, covering the period 90-522 A.D., proving that the Maldives were known to travellers in the Mediterranean countries. In 362 A.D., Ammianus Marcellinus records that among other nations, the "Divis" (Maldivians) sent gifts to the Emperor Julian (Bell 1940: 16; Maloney 1980: 415). Other writers who have mentioned islands which may be identified as Maldives include Pappus of Alexandria (about the end of the 4th century), Scholasticus the Theban (*c.* A.D. 400) and Cosmas Indicopleustes (*c.* 535 A.D.) who probably gives the first eyewitness description of the islands (Maloney 1980; Mikkelsen 2000).

Chinese documents from 658 and 662 A.D. record visits to China from ambassadors of King Baladitya of Maldives, who brought gifts to the Emperor of China, consisting of products from their country. These documents also mention the dependence of Maldives as well as some other countries of the South Asian region on the ruler of South India, showing that at that time, there was an interdependence of these countries on the sub-continent, and that they had contacts with one another.

Other informative sources are the written records of travellers who came to the Maldives during the period in question. Some writers wrote their records from hearsay, and some from first hand information gathered during their travels in the Indian Ocean. Among these are Arab and Persian travellers and merchants, who crossed the Indian Ocean in search of commercial opportunities in the trade in ambergris, tortoise shell and spices. The descriptions given by some of these travellers are convincing and corroborate the information given in other accounts. There are also descriptions of boat-building techniques unknown to the visitors; techniques used Maldives in the until recent times.

The most accurate information on Maldives, is given by Sulaiman (850 A.D.), Al Masudi (visited Sri Lanka in 916 A.D.), Al Biruni (1030 A.D.) and Al Idrisi (1150 A.D.). These writers give detailed information about Pre-Islamic Maldives, which they called Divah or Dibadjat, its people, culture and society as well as trade (Bell 1940; Maloney 1980; Mikkelsen 2000).

Accurate geographical descriptions of Maldives are given, about islands that lie between the sea of Harkand (Bay of Bengal) and that of Lar (Gujarat), and number up to 1,900. The produce of the islands, including ambergris from the seashore and cowries collected in the same way as in later centuries, are mentioned. Weaving of fabric, building of ships and houses and all kinds of work are said to have been executed with consummate art. These accounts say that a queen ruled the islands, and the wealth of the country consisted of cowries, which the queen amassed in large quantities in the royal depots (Sulaiman 850 A.D.; Masudi 916 A.D.).

The erosion of some islands, the formation of new islands, and the migration of the populations from one to another, is described in detail (Abu Zayd 890 A.D., Al Biruni 1030 A.D.). Al Jawaliqi, writing in 1135 A.D., describes a queen named "Danhara"who wore a robe of gold fabric, rode on an elephant and was accompanied by her attendants and army. She was the ruler of the kingdom and lived on an island called Abannba (Male'), where the inhabitants were in great number (Al Jawaliqi 1135 A.D.). Al Idrisi, writing in 1150 A.D. calls this chief island "Ambriya" (Al Idrisi c. 1150).

The best description of the pre-Islamic culture of Maldives is given by Al-Idrisi. Writing in Arabic in his book, "Kitab Nuzhat Al Mushtaq Fi Ikhtiraq Al Afaq" he described some of the customs of the country. He says that the islands had a king who united them, protected and defended them and made truce according to his ability. His wife acted as arbitrator among the people and did not veil herself from them. When she issued any orders, her husband, the chief, although he was present, did not interfere with any of her ordinances. It had always been a custom with them that women arbitrated, a custom they always upheld. Al Idrisi also says that this queen had riches, which she collected by means of certain known taxes, and she then gave in charity the wealth thus acquired to the needy inhabitants of her country. Her subjects are said to have hung silk cloths along her route during her public appearances (Al Idrisi *c.* 1150 A.D.).

Al Idrisi states that tortoise shell was the merchandise of the people of Dibajat (Maldives). He writes that coconuts were cultivated on the islands and cowries were used as means of exchange and these were said to comprise most of the King's treasures. He described the inhabitants of Dibajat as accomplished and skilful craftsmen. As an example, he says they would weave a shirt with its two sleeves, its gores and its pocket, all in one piece. He also states that the islanders built boats of small pieces of wood, and substantial houses and other excellent buildings of hard stones. They are said to have constructed wooden houses that floated on the water. These were probably storehouses for coconuts, built on platforms in the shallow water, to keep out rodents. These wooden houses were called "moodhuge" (sea houses), and were in use until the early years of the 20th century. Sometimes the islanders used perfumed sandalwood in their buildings, for pride and display (Al Idrisi *c.* 1150 A.D.).

He also speaks of the "sewn" boats used for travel in the "Sea of India and China". Whether big or small, these were constructed out of well-hewn wood. The planks were put edge-to-edge and trimmed and then "sewn with fibre" (tied with coir rope). The boats were then caulked with the oil of the sperm whale, to stop up the seams. Even at the present day, boat building in Maldives is called "dhoani banun", which literally means tying boats, the term used in the days when the above technique was employed. People from Oman and Marbat (Hadramaut), belonging to Yemen, came to the islands and cut the wood of the coconut palms and made ropes from the fibre of the palm with which they tied up the wood. They took this wood back to their own countries and sold it or used it for different purposes (Al Idrisi *c.* 1150 A.D.).

Trading links with other countries seem to have been established very early. Cowrie shell exports from the Maldives can be traced to the early centuries of the first millennium, which links Bengali, African and even European sources. The discovery of a Roman coin, identified as a Roman Republican Denarius of Caius Vibius Pansa minted at Rome in either 90 or 89 B.C. within a reliquary of a Buddhist stupa excavated during 1958 in the Maldives (Forbes 1982), gives rise to many questions. The worn state of the coin and the fact that it was pierced indicated that it had been used for some years before ending up in the ancient stupa. It also seems to indicate that some early contacts were made between the Roman trading establishments in India and the Maldives. The reason for these contacts, if any, may have been the availability of cowrie shells, money cowrie (*Cypraea moneta*), in the islands. Cowrie shells have been discovered in many different places of the ancient world, and the primary producer of most of these was understood to be the Maldives (Heimann 1980). As stated earlier in the literary sources, indications are, that the Maldives was known to the outside world as early as in the Roman period.

Archaeological Evidence

It has been established that Buddhism was the religion of the Maldives before the conversion to Islam in 1153 A.D. Evidence of this fact is overwhelming. Mounds containing ancient Buddhist artefacts have been found in many islands throughout the Maldives. The first reference to archaeological sites in Maldives was made in 1835, by English naval officers Lieutenants I.A. Young and W. Christopher. They had been told by a Buddhist priest, "who was well-read in Sinhalese Books, that two noted Temples of Buddha" formerly existed in Maldives (Bell 1940: 104)). Two other visitors to Maldives, Mr. C.W. Rosset in 1886, and Mr. J. Stanley Gardiner in 1900, also recorded information on the presence of ruins of Buddhist buildings on several islands (Bell 1940: 104-105).

However, the most valuable contribution to archaeological data on pre-Islamic Maldives was made by Mr. H.C.P. Bell, who collected a wealth of information during his later visits to Maldives. Mr. Bell first visited Maldives in 1879 on another mission, and at the end of that visit, he made the following observations in his provisional report:

"Whilst the evidence so far available is both quite insufficient, and of a nature too vague, to warrant definite conclusion, it is far from improbable that a close scrutiny of names of Islands, of non-Muhammadan (non-Muslim) customs and festivals, and, above all, an Archaeological Survey will make it abundantly clear that Buddhist Missionaries, in the spirit of the Ashokan Edicts, departing to intermingle among all unbelievers, teaching better things, carried their doctrine across the sea even to the despised and little known Maldives." (Bell 1940: 104).

The above observation suggests that Mr. Bell felt that it was quite probable that Buddhism was brought to the Maldives about the same time as when missionary activity encouraged by Emperor Ashoka took place, resulting in the establishment of the religion in many South Asian countries. However, it is left to doubt, whether the ancient missionaries regarded the Maldives as "despised and little known." As additional evidence of the islands' past religion, Mr. Bell noted the titles given to Maldivian royalty, and further, the names of certain islands, which were suggestive of a Buddhist past.

Mr. Bell returned twice more to Maldives. He visited many of the islands in the southern atolls, which contained ancient mounds and investigated some of them. His findings were published in detail in his monograph on the history, archaeology and epigraphy of Maldives in 1940. These and subsequent findings of amateur Maldivian archaeologists proved beyond doubt that Buddhist places of worship existed in Maldives before the conversion to Islam.

In July 1958, a Maldivian team excavated the archaeological site in Thoddoo island in Ari Atoll, where a figure of the Buddha (Fig. 2.) and a relic casket was found. This was the reliquary in which the earlier mentioned Roman coin was found.

An amateur archaeological expedition was undertaken by a Maldivian team in February 1959, to Ariadhoo island in Ari Atoll, where some ancient mounds were investigated. No Buddhist relics were found, but another important relic was excavated, a carved coral phallus (linga), 15 inches in height and 12 inches in circumference at the base (Maniku 1993:41). This was a unique find in Maldives, and lent weight to the theory that Hinduism had also existed in the country during a bygone age.

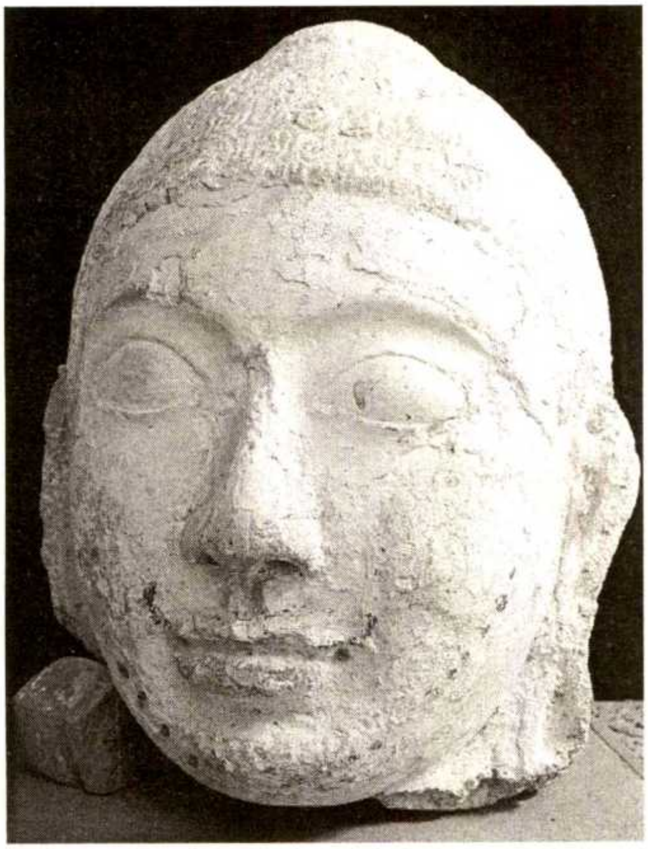

Fig. 2: The head of the Buddha statue excavated from a stupa in Thoddo Island

In later years, several artefacts including images, caskets and miniature stupas belonging to the Vajrayana sect of Buddhism, were found in various places in Male' and in Ari Atoll. A later archaeological find, also of Vajrayana context, had carvings of Hindu deities Siva, Lakshmi, Kubera and sage Agasthiya. The cult of sage Agasthiya, being related to maritime activities, was common in South India, Sri Lanka and also in Southeast Asia (Ragupathy 1994).

In 1983-84 the Maldivian Government in collaboration with the Kon-Tiki Museum of Oslo, undertook some excavations in Nilandhoo in Nilandhoo Atoll, one of the southern atolls of Maldives. The report of this expedition states that the ancient Havitta (chaitya) ruin on Nilandhoo Island was built about 400 years before the conversion to Islam. It further stated that the finds of discarded building material with classic designs, in the fill inside the ruins, indicated an older structure in the same locality, or in the neighbourhood (Skjolsvold 1991). This could indicate an older Buddhist structure, or one belonging to an earlier religion, since the ancient Maldivians built places of worship on older sites, after destroying the existing buildings.

The same team visited other islands, which had ancient sites, including Vaadhoo and Gan in South Huvadhoo Atoll. During their short stay in Gan, they found interesting material, reminiscent of such sites in other countries of the region. Finds from Bodu Havitta, the biggest mound on the island, included many decorated and moulded coral stone fragments with a common motif. These were decorative elements including symbols of concentric circles with a trisected band-like decoration on either side. They found especially striking, the similarity of this design with the decoration displayed on a marble panel at Amaravati, depicting "The Great Departure", a panel dated to the second century A.D. The same motif occurs on railings at the entrance of a Buddhist cave sanctuary at Udayagiri in Orissa (Skjolsvold 1991: 52-54 and 67-69). Due to the lack of time, the team did not have the opportunity to carry out a full excavation of the site.

In cooperation with the National Centre for Linguistics and Historical Research in Male', archaeological excavations were conducted at Kaashidhoo Island in Kaafu Atoll, by Professor Egil Mikkelsen of the University of Oslo, Norway, from 1996 to1998. These excavations revealed that a Buddhist culture was established there "in the first part of the first millennium A.D. probably founded on an Indian origin. Exchange relations were established with South Asia and according to written sources, also with the Roman World, and later also with China" (Mikkelsen 2000: 22). There was also a Chinese bronze coin, a cash-coin from the Northern Song Dynasty, struck under the Emperor T'ai Tsung in 990-94 A.D. (Mikkelsen 2000: 21), indicating Chinese contacts in the 10th century.

The available findings led Mikkelsen to believe that cowrie shells played an important role in the Buddhist culture and religion that existed in Maldives at that time, symbolically, as well as in terms of economics. In his report he states that, around 500 A.D. when cowrie shells spread to northern and central Europe, as shown by archaeological finds, they were also mentioned as trading products from Maldives (Mikkelsen 2000). The ruler of Maldives had control over the export and exchange of cowrie shells, leading to the import of other commodities such as beads, gold and silver as well as metal objects which were not available in Maldives. Other materials exchanged for cowries included pottery, china and clay objects for everyday use. Mikkelsen was of the opinion that this provided for a rich monastic culture in Maldives and that it could have been the start of the spread of cowrie shells to the north. He felt that distance in itself was not necessarily a limitation on contact (Mikkelsen 2000), which is proven by the fact that cowrie shells from islands in the Indian Ocean found their way to the Far East, even to distant China.

Among the relics found at the Kaashidhoo site were offerings of bones of the giant tortoise (*Aldabrachelys elephantina*), showing that this species existed in Maldives at that time. Bones of turtles were also found (Mikkelsen 2000: 17).

During the last Buddhist period before the introduction of Islam, from the 10th to the late 12th century, part of the monastery site was used as a burial ground. Bones from four graves were carbon dated, resulting in dates varying between the late 9th to the 12th century A.D.

According to Mikkelsen's findings, there were several different stages in the building of the Kaashidhoo monastery, the structures being founded on different levels on older floors. In some places, white coral sand had been used to cover older structures before the construction of new buildings. Since the conclusion reached was, that building commenced around the beginning of the 3rd century A.D., and continued until the 6th century A.D., it may be assumed that by the 3rd century A.D., Buddhism had been well established in Kaashidhoo. Mikkelsen felt that the building of miniature stupas, and conducting of sacrificial ceremonies continued through the 7th to the 9th century. He found many similarities to the type of construction found at Kaashidhoo, at Ratnagira in Orissa state in India. (Mikkelsen 2000: 21).

Language and Scripts

Linguistic research into the Dhivehi (Maldivian) language shows a divergence of Dhivehi from its mother language as early as the 2nd or 1st century B.C. (Cain 2000), indicating that speakers of this idiom may have arrived in the Maldives prior to this period. Linguistic evidence shows a close relationship between Dhivehi and Sinhala, both languages having evolved from the same Prakrit, Proto-Dhivehi-Sinhala. B.Cain (2000: 3) is of the opinion that "perhaps as early as the 2nd century B.C., Proto-Dhivehi-Sinhala came to the Maldives and became the lingua franca of a diverse population made up of Aryan speakers, Dravidians and possibly others" (Cain 2000: 3). Frequent contact with neighbouring countries resulted in their influence on Dhivehi and its development through the following centuries.

The earliest palaeographically datable inscription found in Maldives is a Sanskrit inscription of Vajrayana Buddhism written in the Nagari script and can be dated to the 9th century A.D. (Ragupathy 1994). This inscription is on the cover of a coral stone casket (Fig. 3.)

The earliest Maldivian script is Eveyla Akuru,the oldest examples of which can be found on the Vajrayana images and artefacts that may be datable from the 9th to the 10th century A.D. Later examples of this script can be found in the copperplate records of the 12th and 13th century A.D. Eveyla Akuru has close affinities with Sinhala Elu and Tamil and Malayalam Vatteluttu scripts. As these scripts evolved from a common branch of Brahmi, there are strong similarities between Eveyla, Elu and the South Indian scripts (Ragupathy 1994).

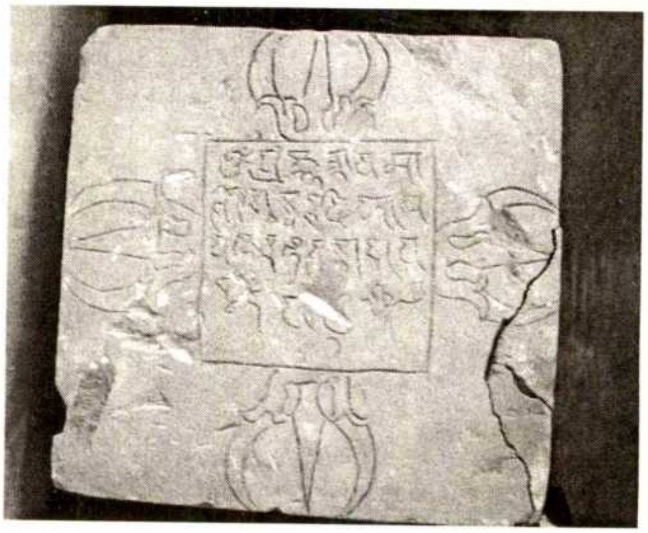

Fig. 3: Cover of coaral stone casket with a Sanskrit inscription of Vajrayana Buddhism written in Nagari script

Conclusion

Interpreting the information gathered from sources within Maldives and data gathered from documents from various parts of the world, the conclusion may be reached that Maldives has been peopled for more than 2000 years. The earliest religion followed by the Maldivians is not known, but the theory that Hinduism had existed at some ancient period cannot be discarded. Immediately prior to the conversion to Islam, the Buddhist religion existed in the islands, archaeological evidence pointing to a Buddhist culture that was in place in the first part of the first millennium A.D.

The islands were independent for most of its known history, and were ruled by kings and queens. The country had its own system of governance suited to its geographical situation. The rulers of the country maintained contacts with countries of the region and powerful nations. The islanders were hardy seafarers, and travelled long distances. Trading vessels called at Maldives and sailors of the Indian Ocean had a fair knowledge of the country. Structures were constructed out of available materials, hard coral stone and the timber of the coconut palm, which grew in abundance. Fishing, boat building and coconut cultivation were some of the important industries of pre-Islamic Maldives.

The difficulty for researchers of Maldivian history lies in the fact that many records and artefacts of that early period no longer exist, and what remained was neglected for many centuries. However, archaeological excavation could still bring to light the historical information that lies buried beneath the soil of these islands, providing the answers to questions on Maldives' pre-Islamic past.

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Early Maritime Activities of Orissa on the East Coast of India: Linkages in Trade and Cultural Developments

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Abstract

In the maritime history of India, Orissa (ancient Kalinga) played a significant role in spreading Indian culture to other parts of the world, including Africa, Rome and Southeast Asia. Archaeological findings, explorations and excavations at various sites, epigraphical and numismatic evidences of different periods, and literary records, enabled the reconstruction of the maritime history of Orissa. In this paper an attempt has been made to trace the nature of trade and cultural contacts between Orissa and other countries of the world from various sources. Besides attacks by neighbouring kingdoms, and unsound economic condition, the geological processes like tectonic activities, sea level changes and sedimentation were also equally responsible for the decline of ports of Orissa. However, the maritime traditions are preserved in the cultural festivals of Orissa, which are celebrated as commemorative traditions.

Introduction

In ancient and medieval times, the present geographical landmark of modern Orissa was at times much larger and passed under the names such as Kalinga, Utkala, and Odra Desa. The Okkala or Utkala, the Kalinga and the Odra or Oddaka were mentioned in literature as tribes. Before and after the birth of Christ, Orissa (Kalinga) was a formidable political power, extending from the Ganga to the Godavari River. Approximately from 11th to 16th century the name fell into disuse; instead the name Odra Desa was gradually transformed into Uddisa, Udisa or Odia and finally it became Orissa in English.

Orissa has passed through various phases of development since the early centuries of Christian era. The geographical setting of Orissa has also played a vital role in the progress of maritime activity. The Bay of Bengal adjacent and the Indian Ocean beyond helped the developing international trade and commerce as well as foreign relations. The littoral region provided suitable facilities to set up ports and the deltas served as natural harbours of Orissa. Besides, the navigable rivers like the Ganga, Mahanadi, Vamsadhara, Godavari and others helped develop hinterland trade and commerce. The hill tracts of Western Orissa provided precious and semi-precious stones for overseas trade. It was easy for traders of north India to reach the ports of Orissa without any hindrance. From the available literary, inscriptional, numismatic and archaeological findings it is possible to locate the ancient ports and reconstruct a picture of the maritime history of Orissa.

Coastal Geomorphology of Orissa

The physical features of the coastal regions of India are a sort of *terra incognita.* The coastal plains of Orissa are narrow in the north, wide in the middle, and narrow in the south (Sinha 1971). Coastal Orissa is characterised by wide deltas. The monsoons are a great force in shaping the shore features. The ports on the east coast of India such as Ganjam, Kalingapatnam and others are protected by spits. The ports owe their existence to the projection afforded by bars and spits. The beach features work as natural breakwaters, providing relatively sheltered anchorage to these ports (Ahmad 1972). Further, the rivers of Orissa have created large deltas at their confluence with the Bay of Bengal. The Mahanadi delta starts its projection on north east of Chilka lake. The sediments brought by longshore drifting from the southwest during the Southwest monsoon, and currents or drifts are arrested in the Chilka lake. Starting from east there is a straight shoreline for about 120 km between the Mahanadi delta and Srikakulam. There are only two marine inlets within these long stretches, one at the narrow mouth (400-600 m) of the Chilka lake and the other on the mouth of the Rushikulya river. Chilka lake is located on the southwest corner of the Mahanadi delta and connected with the sea through a tidal inlet. It has wide sandy beach ridges and barrier spits which separates it from the Bay of Bengal.

Ports of Orissa

Ptolemy's Geography of Ancient India, (2nd Century A.D.), mentions that major and prosperous ports of Orissa such as Nanigaina (Puri), Katikardama (Kataka or Cuttack), Kannagara (Konarak), and river mouths Manada (Mahanadi), Tyndis (Brahmani), Dosaron (Baitarani ?), Adams (Subarnarekha ?), Minagara (Jajpur ?) and Kosamba (Pipili or Balasore) had overseas trade relations (McCrindle 1985). However, Ptolemy did not refer to the other ports of Orissa namely Manikapatna, Palur, Che-li-ta-lo, Kalingapatnam, Pithunda, Khalkatapatna, which also played a dominant role in the maritime history of Orissa (Fig. 1). Subsequently, Arab and Persian writers of the 9th and 10th centuries A.D. throw valuable light on the sea borne trade and seaports of Orissa. Ibn Khurdahbin, Ibn Rusta and the anonymous author of the *Hadud-al-Alam* mention the main places and ports of Orissa under the Bhaumakara dynasty namely Mahisya (Midnapore), Jharkharo (hilly tracts), Orissa (Orissa proper) and Ganjam (South Orissa). In the Andhra region (a part of the Telugu speaking territory) the main ports were Kalinganagar, Keylkan, Al-Lava and Nubin of which last three have not been identified (Panigrahi 1981). The other post 15th century ports were Balasore, Pipili, Ganjam, Harishapur, Chandabali and Dhamra which are worth mentioning here due to their role in the maritime activities of Orissa during the colonial period (Tripati 1997). Out of all these ports, some were active and continued to be so for long periods. Some ports became prominent during a particular period and perished or lost their significance subsequently. Many ports were used for export of commodities to far off countries, while some ports were meant only for internal trade and transport by boats.

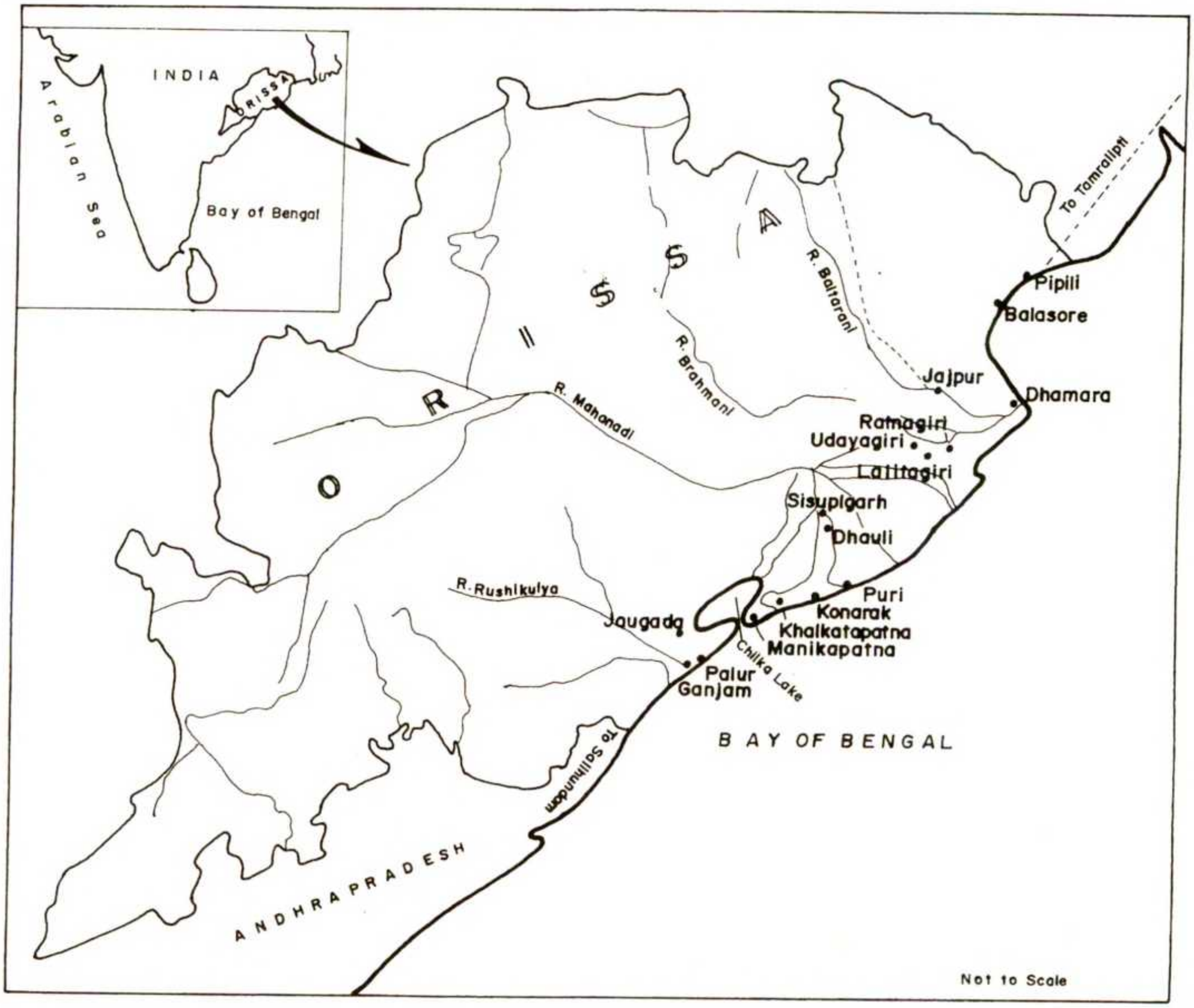

Fig. 1: Ports and excavated sites along the Orissa coast

Archaeological Evidence

The archaeological excavations at Sisupalgarh, Jaugada, Tamralipti, Palur, Manikapatna, Khalkatapatna, Kalingapatnam have yielded evidences of foreign contacts during early centuries of the Christian era. The excavations at Sisupalgarh (Fig. 2; Lal 1984) Manikapatna, Radhanagar of Orissa, Chandraketugarh and Tamralipti in West Bengal, Salihundam and Dharanikota in Andhra Pradesh, and Arikamedu, Poompuhar, Korkai and Algankulam in Tamil Nadu have brought to light the evidence of Rouletted Ware which is datable to 2nd-1st century B.C. Moreover, Rouletted Ware is also reported from Buni Complex in North Java, Sembiran in north coast of Bali, Buu Chau Hill and Tra-Kieu in central Vietnam, Kantarodai and Jaffna in Sri Lanka and Mahastan in Bangladesh. This ware was manufactured at Salihundam, Satanikota, and Kesarapalle of Andhra Pradesh and distributed to the places located on the west and northeast of Andhra Pradesh. The presence of Rouletted Ware in Bali, Anuradhapura and Java indicates that it might have come from Arikamedu or some other sites of Andhra Pradesh (Nigam 2001). Begley (1983) has suggested that Arikamedu was the main centre for the production of the Rouletted pottery in large quantity for trade and domestic uses. It is believed that the Rouletted Ware is the evidence of Indo-Roman trade, and was imported from the Roman Empire. The coarser varieties were made in India. The XRD diffraction analysis (Gogte 2000) of Rouletted ware of South India and Southeast Asia shows that the mineralogical contents and the soil samples from coastal Bengal are the same. Rouletted Ware of Manikapatna is similar to that of Sisupalgarh and Arikamedu as far as the mineral content is concerned.

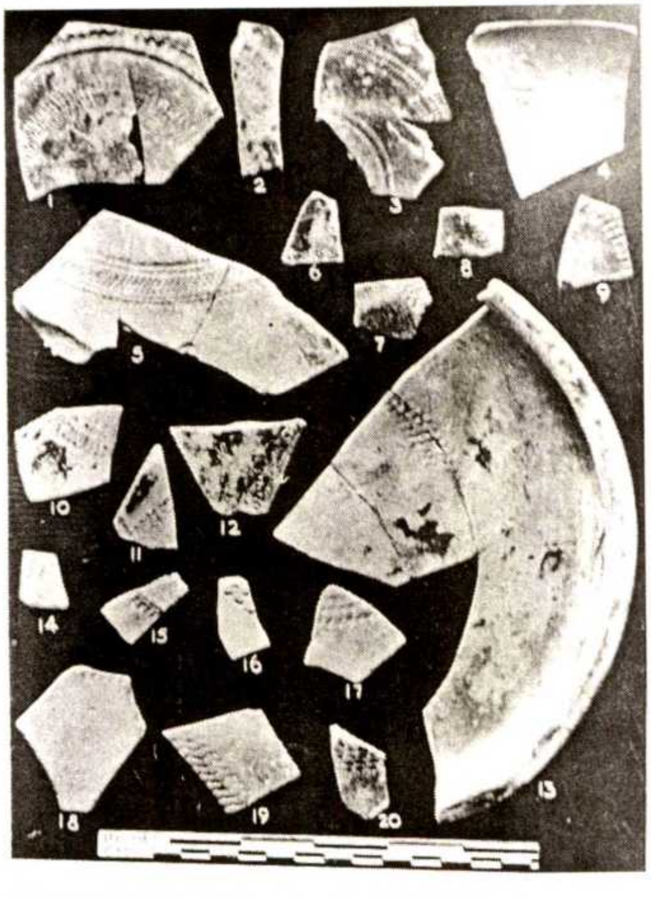

Fig. 2: Rouletted ware from Sisupalgarh, Orissa

Knobbed Ware has been reported for the first time from Sisupalgarh in Orissa, then at Jaugada, Lalitagiri, Manikapatna, and Radhanagar (Mishra 2000). Subsequently, knobbed vessels have been reported from northern Andhra Pradesh, coastal Bengal and Assam (Glover 1990). This ceramic is concentrated in the Early Historic Period. Further Glover (1996) has emphasised that this pottery is associated with Buddhist rituals. Knobbed vessels occur in different fabrics such as fine grey ware, Red and Black ware. Knobbed ware has a boss or a projection at the centre of the base. The time range of this ware is early centuries of Christian era. Similarly, the finding of Northern Black Polished (NBP) ware at the port sites and some other sites along the coastal Orissa, Andhra Pradesh and Tamil Nadu has provided evidence of coastal trade on the eastern Indian littoral. The occurrence of Punch Marked Coins (PMC) and the NBP at Gedige and Anuradhapura came to light during the Mauryan period. The recent excavation at Anuradhapura and Mantai in Sri Lanka (Sarma 1990-91) shows the contact of Orissa with Sri Lanka during early centuries of Christian era.

Semi-precious stone beads have been reported from various excavation sites of Orissa and Southeast Asia. About 180 beads of carnelian, agate, chalcedony, glass and terracotta have been reported from Sisupalgarh (Lal 1984). Evidences of manufacturing of beads have been reported from Jaugada and Asurgada in Orissa (Mohapatra 1986). Further, Ban Don Ta Phet, Ban Chiang, Karbi, Khao Sam Kao of Thailand, Tanjong Pawa, Kalum Pong in Malaysia, Salebabu island in Indonesia, Beikthano in Burma, and Palawan island of Philippines have reported semiprecious stone beads (Glover 1990). The earliest site to have yielded evidence of Indian contact is the Ban Don Ta Phet in Thailand where a number of agate and carnelian beads have been reported. These beads belonging to 2nd to 3rd century B.C. appear to be introduced from India (Higham 1989). The bronze bowls with a knob in the centre of the base found in the burials of Thailand give an indication of Indian contact. The shape of these bowls is similar to those found in coastal Orissa and Bengal (Ray 1989). India has plentiful source of carnelian (Glover 1996) so that this semi precious stone and glass were imported from India to Southeast Asian countries in order to manufacture beads, and the same were exported again after the final production. Further there is evidence that bronze bowls with a high tin content found at Ban Don Ta Phet were certainly exported from Thailand. The Satavahana rulers had issued bronze coins with high tin content (23%) and it appears that the tin was imported from Thailand.

Numismatic Evidence

The finding of coins along with other archaeological artefacts indicate trade contacts between one region and another. A unique type of punch-marked coins with ship symbol are found from the earliest levels at Chandraketugarh in West Bengal which are similar to boat symbol coins issued by the Satavahana kings. Such coins were also found on the Andhra coast. In Northern Sri Lanka a single mast boat coin in conjunction with a donatory inscription of 1st century B.C. is found. The ship symbol is noticed on the terracotta sealings and in the graffiti on pottery found from the coastal regions, as well as the trade centres along the Ganga. Similar types of objects from Vaisali depict a boat with a prow, stern, oar, passenger decks and a female standing in the boat (Ray 1991).

The Satavahana coins depict both single and double mast ships anchored in mid sea. Gautamiputra Yajnasri (A.D. 184-213) issued these type of coins prominently. The 'ship' coins have been found at Buddham, Vidyadharapuram, Guntur, Chebrolu and other places on the east coast of India (Sarma 1980). The double mast ship type coins were also issued by the Salankayanas (Vijaya Devavarman, *circa* 280-293 A.D.) who succeeded the Satavahanas in the Vengi country (Sarma 1989). The Roman coins of Tiberius (A.D. 14-37) were found during excavations at Salihundam (Subramanyam 1964). Similarly the excavations conducted at Bavikonda and Thotlakonda in the district of Visakhapatnam reveal Roman coins of Augustus (31 B.C.-A.D. 14) and Tiberius (A.D. 14–37) (Sree Padma 1993). The Roman gold coins of Gordian, Constantine and other rulers found at Bamanghati and Tamralipti show evidence of contact with the Romans (Warmington 1974). Four denarii, three of Augustus and one Tiberius coins were reported from Kotppad, and 23 gold coins from Gumada of Orissa (Turner 1989). One complete and two fragmentary copper coins with square perforation in the centre with Chinese legend were found from Khalkatapatna, belonging to the 14th century (Fig. 3). Manikapatna excavation has yielded a Sri Lankan copper coin datable to 12th century with the legend *Simad Sahasamalla* (Fig. 4) (Pradhan *et al*. 2000). Similar coins have been reported from Kotchina in Indonesia which prove the maritime network linking coastal Orissa, Sumatra, and Sri Lanka (Behera 1994).

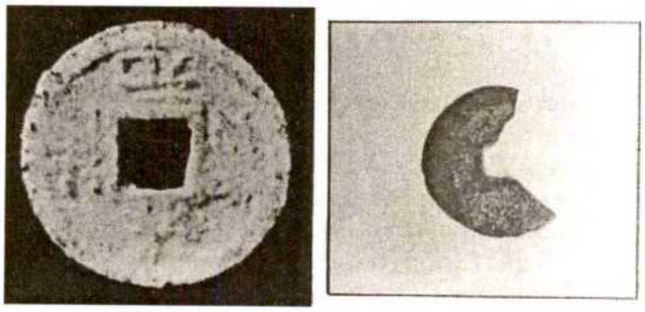

Fig. 3: Chinese coins found during excavations at Khalkatapatna

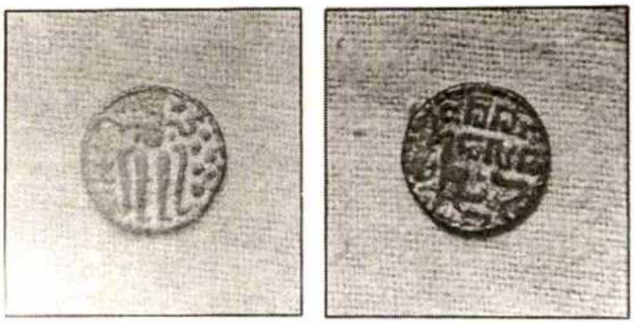

Fig. 4: Coin of king *Sahasamalla*, Sri Lanka found in the excavation at Manikapatna

Epigraphical Sources

The excavations at Chandraketugarh, Bangarh and Hadipur in West Bengal have yielded Kharosthi inscriptions on seals, plaques and pots. The terracotta seals from Bangarh and Chandraketugarh (Fig. 5) depict sea going vessels containing corn flanked by symbols like conch and taurine. Such vessel types are known as *Sasyadidhrta Sthali*, a bowl shaped vessel filled with corn. Another such vessel has legend in Kharosthi-Brahmi script referring to

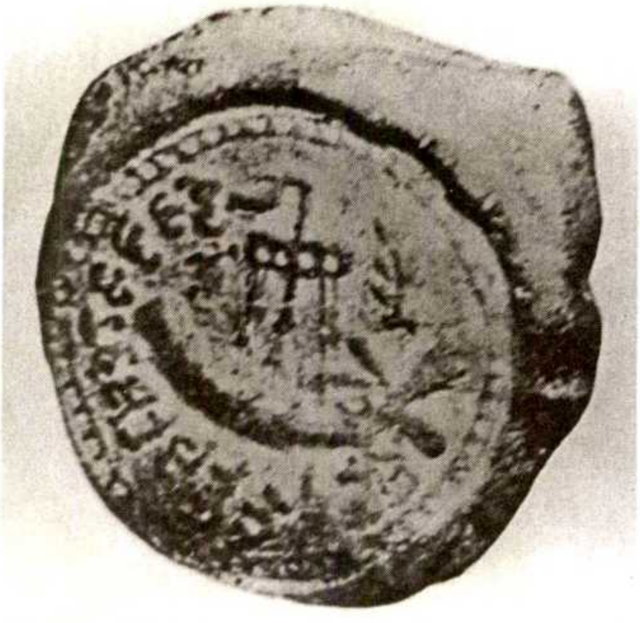

Fig. 5: Terracotta seal showing sea going vessel, Chandraketugarh, West Bengal

Tridesayatra, meaning a voyage to three countries or directions. Yet another seal from Chandraketugarh reveals a type of vessel called *Trapyaka* belonging to the wealth earning Tasvadaja family. It may be noted that *Trapyaka* is a type of ship mentioned also in the Periplus and the *Angavijja*. The above vessel types as well as flanking symbols recall the Satavahana ships. It appears that the Kharosthi script was used by tradesmen settled in the lower Ganga valley of Bengal in good numbers during the third to first centuries B.C. and was mixed up with the Brahmi used by local merchants, developing a mixture type Kharosthi-Brahmi writing with North-western Prakrit expressions (Sarma 1991).

The location of Asoka's Major Rock Edicts at Dhauli and Jaugada suggests the existence of coastal route from Tamralipti to the present Andhra coast, which formerly constituted the southern part of the Kalingan Empire. It is known from the Hathigumpha inscription (1st century B.C.), that king Kharavela defeated the southern confederacy and "caused the procurement of pearls, precious stones and jewels from the Pandya king". He had developed his territory far and wide (Jayaswal 1983). The excavation at Sembiran has brought to light Kharosthi inscriptions on the potsherds which shows the maritime trade contacts between Orissa and Bali (Ardika and Bellwood 1991). The epigraphic sources of the Malayo-Indonesian region frequently mention people called "Kling" which evidently derived from Kalinga and scholars generally agree that it denotes the people of Kalinga. The early legends of Java mention "twenty thousand families were sent to Java by the prince of Kling. These people prospered and multiplied". Java was styled as "Ho-ling" in the Annals of the T'ang period (A.D. 618-906). Scholars usually believe that Ho-ling is the Chinese or old Javanese equivalent of Kalinga. This would suggest that Central Java was so much dominated by the people of Kalinga that the region was named as Kalinga or Ho-ling.

The Telaga Batu (A.D. 686) inscription of Indonesia mentions the special skill of the people such as *Puhawang* (ships captain), *Vaniyaga* (long distance or sea faring merchants), and *sthapaka* (sculptors). The Kaladi (909 A.D.) inscription mentions *wagga kilalan*, meaning a group of foreigners which include Kalingas, Aryas, Sinhalese, Dravidians, and Pandikiras. The term *banigrama* (Sanskrit Vanigrama) means a merchant guild, which have been mentioned in several East Javanese and Balinese inscriptions. Similarly the old Balinese inscriptions of Semibiran B (915 A.D.) and Sembiran A II (975 A.D.) also mention the term *banigrama* (Ardika 1999). The Indonesian inscriptions refer to foreign traders as (banyaga) which includes the Kalingas, Aryas, Singhalese, Dravidians, etc. and a merchant guild as *banigrama*. The Bhaumakara inscription (8th-10th century A.D.) refers to *samudra kara bandha* (sea tax gate) on the bank of Chilka, where taxes were collected from the sea traders of Orissa.

Literary Sources

The people of Orissa dominated the overseas trade and continued their links to far off countries since the remote past. It was so prominent in maritime trade that Kalidasa referred in the *Raghuvamsa* to the king of Kalinga as *Mahodadhipati* or the Lord of Ocean (Nandargikar 1948). In connection with the seashore of Kalinga, the *Raghuvamsa* (6: 57) further mentions *dvipantara* (Indonesian Archipelago) from which breezes, filled with the scent of cloves, blew:

> *anena sardham viharamburaseh tiresu talivana marmarresu*
>
> *dvipantaranvita lavanga puspeih apakrtasveda lava marudbhih*

Further, the *Aryamanjusrimulakalpa* narrates to "all islands of the Kalinga sea" (Kalingodresu) from which appears that in the past the present Bay of Bengal was known as the "Kalinga Sea" being dominated by the ships of Kalinga (Sastri 1920-25).

The *Sankha Jataka*, the *Samudra Jataka* and the *Mahajanaka Jataka*, mention that the traders from central India used to come from Benaras to Tamralipti, from where they sailed to Southeast Asian countries (Law 1967). The *Mahavamsa* mentions that Asoka sent his missionaries to Sri Lanka from Tamralipti. The *Vassentara Jataka* mentions Kalinga as a great commercial and industrial country, from which rice, fine cloth, ivory, diamonds and other goods were exported even to foreign countries. The *Kathasaritsagara* indicates that Tamralipti was the main port for Chinese trade and commerce (Kar 1973).

The Buddhist texts mention the contact of ancient Orissa with Sri Lanka from about the 5th century B.C. onwards. Trade between Orissa and Sri Lanka must have continued in the later period which resulted in the strong political and cultural links between two countries. The contact of Orissa with China is known from the accounts of Huang Tsang who refers to commercial activities of the people. Subhakara Simha, son of the king of Orissa, (Wu-ta (Odra) country), went to China carrying with him many Tantric texts in A.D. 790, who may be identified with Sivakara or Subhakara of the Bhaumakara dynasty who had sent a Buddhist text for the great Tang emperor of China. The *Chu-fan-chi* of Chau Ju-Kua written in A.D. 1225-26, refers to Kia-ling sea going vessels (i.e. Kalinga ships) and their system of trade organisation. Chau Ju-Kua mentions two types of ships plying between Kalinga and Canton.

Art and Sculptural Evidence

Buddhism played a significant role in the relations between Orissa and Southeast Asia. Comparative studies of Buddhist art of Orissa and Southeast Asia show several common elements and resemblances. The archaeological excavations at Ratnagiri, Udayagiri, and Lalitagiri in Orissa have brought to light the remains of Buddhist art. The Buddha heads from these centres and those from central Java share common characteristic features of massive form, modelling affinities and facial expressions. Similarly the Buddha and Boddhisattava images of Borobudur, Indonesia, and Orissa have common traits. The Javanese Boddhisattavas from Chandi Mendut have their attributes placed on long lotuses in the style distinctive of the Lalitagiri figures of Orissa (Tripati 2000). The presence of the giraffe, an African animal in the temple of Konarak (13th century) suggests contact with Arab merchants who might have been commissioned to bring this animal from Africa to the eastern coast. In the early 15th century the Chinese Admiral Chang Ho, who visited East Africa is known to have brought a giraffe to the Ming court of China (Behera 1977). Further the maritime pride of Orissa is also reflected in sculptural representation of boats in the temples of Puri and Bhubaneswar.

Overseas Routes

In early times, long distance overseas trade was not possible without making a halt at intermediate places for water and food. The ships of Orissa bound for Southeast Asian countries passed via the Andaman and Nicobar Islands (Fig. 6). Sailors voyaging from Tamralipti, Palur and Kalingapatnam to foreign countries used the Nicobar Islands as a halting station. I-Tsing mentioned that it was a month's sail from Tamralipti to Nicobar Islands, and China from Sri-Vijaya was twenty days sail (Syamchaudhuri 1977). From Tamralipti there was regular sailing of vessels which either proceeded along the coast of Bengal and

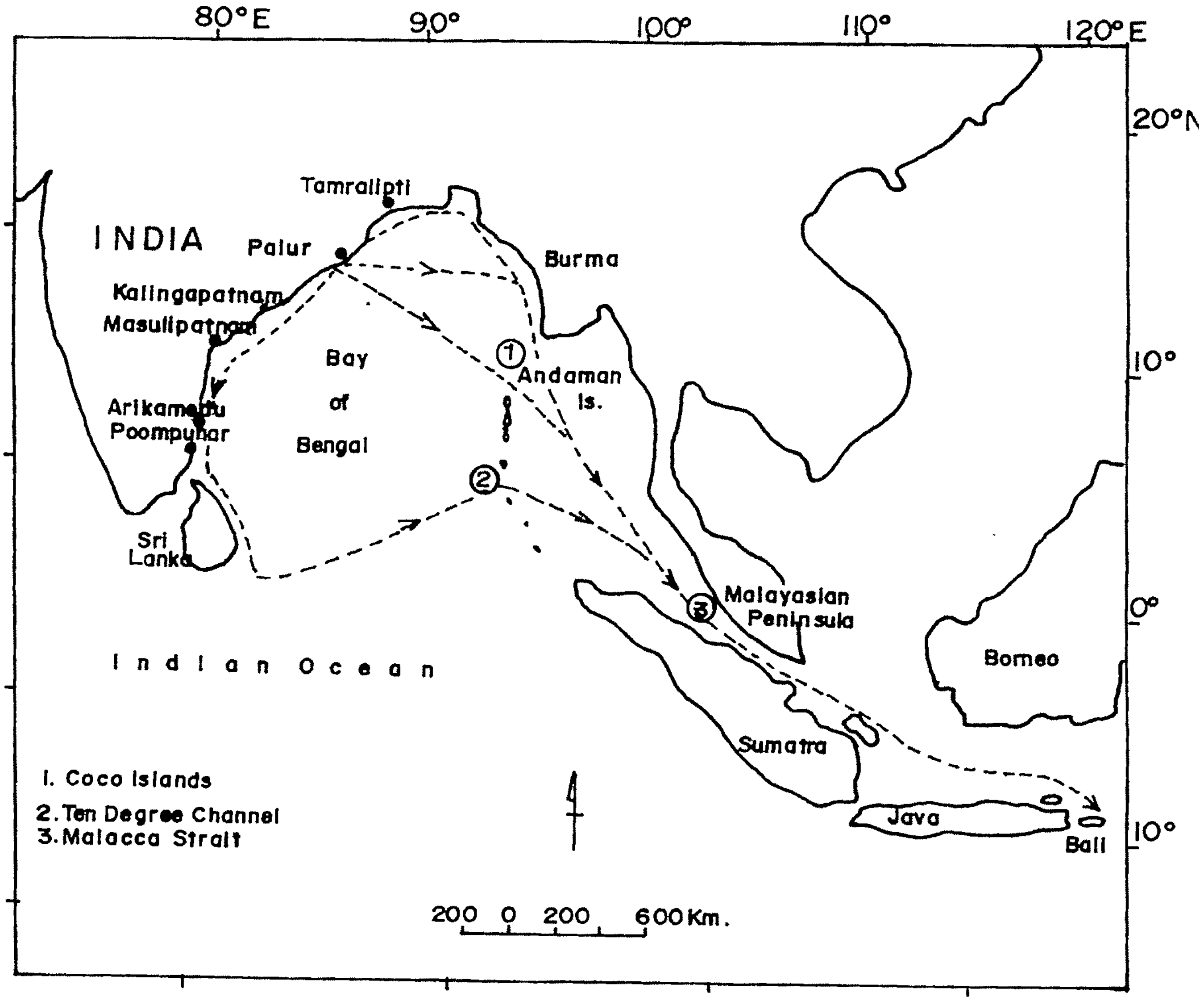

Fig. 6: Sea routes from Orissa to Southeast Asian countries

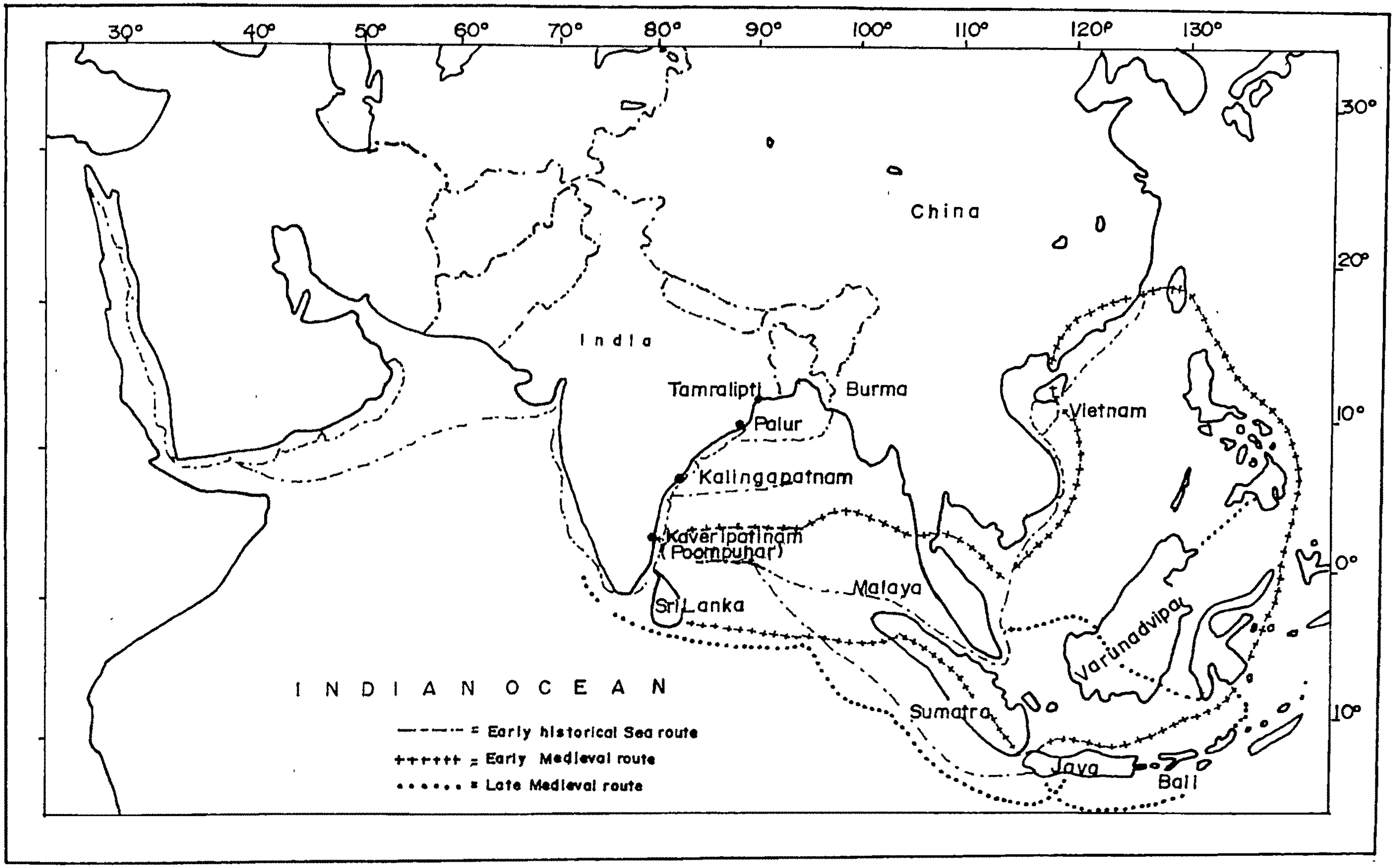

Fig. 7: Maritime trade routes of east coast of India and Southeast Asian countries

Burma, or crossed the Bay of Bengal and made a direct voyage to the Malaya Peninsula and then to the East Indies and Indo-China and beyond it. In making their voyages to Southeast Asia, the sailors and merchants of Orissa may have sailed around the Malay Peninsula through the Strait of Malacca. The other route must have been from Orissa to South India where one sailed through the area between the Andaman and the Nicobar Islands or between Nicobar Islands and Achin, the northern tip of Sumatra, disembarking on the peninsula around Takuapa or at Kedah. The ports of embarkation were Palur, Poompuhar, Arikamedu, Sopatma, and Masulipatnam from where ships sailed across the Bay of Bengal to the coasts of the Southeast Asia and the Far East. Ships used to go to Java from the ports of Orissa and return directly to Sri Lanka and other ports on the east coast of India (Fig. 7). Further, these ships took a course to the northeast from Java to reach Canton. This was the route followed by the merchants who traded with the West and the East (Prasad 1977). There was a regular coastal voyage from the mouth of the Ganga along the eastern coast of India to Sri Lanka. People from all ports of India came by land or river route to the nearest sea port and then made a coastal voyage to Tamralipti, Palur or to one of the ports near Masulipatnam, from where ships made a direct voyage to the Far East across the Bay of Bengal. The sailors and merchants of Kalinga had landed at various places including Srikshetra in Burma, Takkola, Kokkonagara, Kataha Kadharam in Malaya Peninsula, Sri Vijaya in Sumatra, Purva Kalinga in Java, Tonking in Cambodia and Kwang-fu in China (Tripati 2000).

Discussion and Conclusion

The available sources such as the epics, Jataka stories, *Raghuvamsa, Kathasaritasagar*, inscriptions, and excavated antiquities bring to light the trade and cultural contact of Orissa with distant overseas countries through the ages. In spite of several hazards and the problem of piracy the Orissan seafarers undertook maritime trade for the sake of wealth. The archaeological findings at Sisupalgarh, Manikapatna, Palur shows that trade was flourishing till the Gupta period. As archaeological evidence is not found during the post Gupta period (6th-7th century A.D.) it appears that there was a decline of maritime trade through Orissa in this time. However, maritime trade revived during the Bhaumakara period and it flourished again after 10th and 11th century.

The excavation at Manikapatna has brought to light pottery of both indigenous and foreign origin. Along the east coast of India Manikapatna is the only site from where varieties of ceramics have so far been reported. The presence of pottery, coins, and art evidence indicates the impact of early sea trade between Orissa and the Mediterranean world. The discovery of Rouletted Ware all along the east coast of India and Kharoshthi scripts and semi-precious stone beads suggests that the internal contact between Orissa, Bengal, Assam, Tamil Nadu had already began by about 2000 years ago.

The evidence from Manikapatna proves the East and West maritime trade relations. With the increase of Roman influence along the Indian coast, the Indian traders left for Southeast Asia countries in search of spices and sandalwood. Based on the available references and archaeological findings at Orissa, Southeast Asian countries, and other places, it is clear that the sailors knew about these lands and the products. It is worth mentioning here that historians have believed the weak successors, economy under the feudatories, attack by neighbouring kingdoms, imposition of taxes, and unskilled navigation contributed to the decline of maritime activities of Orissa. In addition to this it is noticed that the geological processes such as the coastal erosion, sea level changes, tectonic activities, natural hazards, sedimentation, and formation of sand bars and dunes in the navigational channels are equally responsible for the decline of ports of Orissa (Tripati 1992-93). It is known that Balasore and Konarak were the ancient ports, which are presently 15 and 4.8 km away from the seashore respectively. Ahmed (1972) states that this is due to the uplift of land. Chilka was a busy port in the historical times and sedimentation caused the disuse of the port. The diversion of river course due to the formation of sand dunes made the Palur port non-operational. To understand in detail the geological processes from archaeological point of view no systematic studies have been carried out along the coast of Orissa. The coastal survey and offshore explorations at strategic locations, excavations at new sites, and comparative study of art evidence of Orissa may shed new light on the maritime activity of Orissa with the outside world.

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Early Maritime Trade Network of Bengal

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Abstract

The present paper deals with the early maritime trade network of Bengal within the time frame of 4th century B.C. to 4th century A.D. It has been generally accepted that Bengal had maritime contacts with Rome and China since the Early Historic Period. This perspective gradually changed the basic conception of the history of Bengal because it brought into focus an important element, i.e., international trade, against the known perspective of agrarian culture. However, scholars were unable to pinpoint their proof of maritime contact, because much of their hypotheses were built on literary evidence. In this paper, an attempt has been made to overcome the shortcoming by examining the cultural materials found in archaeological contexts and also in museums and private collections in Bangladesh, India (West Bengal), Sri Lanka, Myanmar and Thailand. The cultural materials discussed include the Northern Black Polished Ware, Rouletted Ware, Knobbed Ware, amphorae, glass,semi-precious stone beads and seals and sealings with Kharoṣti-Brahmi inscription. Finally, the nature of trade network has been examined by using the criteria suggested by Evers (1991).

Introduction

Today it no longer startling to claim, at least in scholarly circles, that it is a myth to conceive of the early history of Bengal in the light of an agro-based rural economy. For the last fifty years, a number of historians have written eloquently to prove that Bengal indeed had established maritime as well as overland trade contacts with the Roman Empire, Southeast Asia and China from the Early Historic to the Gupta Period. During this period, international trade contributed greatly in building a flourishing economy for Bengal. However, when one probes deeper into these research works, one invariably lands on tentative hypotheses, conjectures and hunches, for these are based on literary evidence, much of which is in the nature of fables and fiction. Arduous efforts by archaeologists made over the last three decades have revealed a rich collection of artefacts, each pregnant with startling revelations of Bengal's past. This paper will attempt to identify, with the help of these archaeological artefacts, the maritime trade network of Bengal within the time fame of 4th century B.C. to 4th century A.D. Hopefully, much of what 20th century historians of Bengal have conjectured will now stand on 'hard facts'.

To begin, it may be helpful to remember that 'Trade became possible when man had learned to exploit nature and to produce beyond his immediate needs. The surplus he thus created, he could exchange with other peoples, taking from them their surplus in return' (Michael 1985: 175). In this study, 'trading network' has been taken to indicate a 'social process of exchange' (Evers 1991: 145). Very much like any other social process, a trading network is based on social transactions between people, but with the important distinction that the main objective of the transaction is exchange of commodities. The following points may be cited as criteria for defining a trade network:

1. Ethnic or religious homogeneity of traders but diversity of partners
2. Regular interaction between trading partners along definite trade routes
3. Evolution of the network over time
4. Typical inventory of trading goods
5. Development of distinct trading practices, customs and types of exchange (including typical ways of travelling and typical means of transport)
6. Utilisation of market-place system (Evers 1991: 145).

Trade networks connect 'market places', which can be conceived of as 'nodal points' within the network. The matter of geographical distance or national boundary between nodal points does not need to be a determining factor because networks can extend over long distances or span only a short spaces. This aspect of the network brings up the matter of Wallerstein's (1974: 11) 'world systems' and Evers' (1991: 145) 'local systems' (in which are included the network of small-scale traders involved in peddling fish from the fisherman to the local market and intermediate-scale traders who operate individually and in small lots). The nodal points or market places of trade network in Bengal within the time frame of our consideration, i.e., 4th century B.C. to 4th century A.D., were Chandraketugarh (North 24 Parganas district in West Bengal, India), Tamluk (Midnapore district in West Bengal, India) and Wari-Bateshwar (Narsingdi district in Bangladesh; see Jahan 1999: 207-216). Since these ports were the only outlets for the entire north and northeastern part of South Asia during the Early Historic Period, they played an important role in the history of maritime trade of the entire region.

Archaeological Evidence

Quite a few archaeological artefacts help us ascertain maritime trade network of Bengal from *c.* 4th century B.C. to *c.* 4th century A.D. Important among these are imperishable materials such as Northern Black Polished Ware, Rouletted Ware, Knobbed Ware, Stamped Ware, Footed Ware, amphorae, glass and semi-precious stone beads, and seals and sealings with Kharosti-Brahmi inscription.

Northern Black Polished ware

The Northern Black Polished Ware (NBPW) is usually made of superfine Ganga clay. It is well fired, thin sectioned, and has a strikingly lustrous surface. It was a precious deluxe ware and was used by the elite class of the society (royalty and Buddhist monks). The ware has mostly been found as bowls, dishes with carinated handles and spouted jars. The chronology of NBPW in the Middle Ganga Plain ranges between circa 700 and 100 B.C. (Lal 1984: 94), whereas in the eastern parts of South Asia the ware has been ascertained from 300-100 B.C. (Chakrabarti 1992: 178).

Northern Black Polished Ware has been reported from the following sites in South Asia: Wari-Bateshwar and Mahasthan (in Bangladesh); Bangarh, Chandraketugarh, Tamluk, Kalahandi, Sisupalgarh, Nasik, Ter, Brahmapuri, Amaravati-Dharanikota, Amaravati-Vaddamanu, Chebrolu, Alagankulam, Korkai, Rajgir, Sravasti, Vaishali, Pataliputra, Kausambi, Ujjaini, Vidisa (Sanchi) and Sarnath in India; Udegram, Charsada and Taxila in Pakistan; Tilaurakot in Nepal; and Anuradhapura-Gedige in Sri Lanka. Interestingly, most of the sites noted above were centres of Buddhism. Some of the sites, such as Wari-Bateshwar (in Bangladesh), Chandraketugarh and Tamluk (in West Bengal, India), Chebrolu (in Andhra Pradesh) and Alagankulam and Korkai (in Tamil Nadu, India) were ports. Others, such as Sisupalgarh (in Orissa), Amaravati-Dharanikota and Amaravati-Vaddamanu (both in Andhra), were not port sites but were situated in coastal region. It is noteworthy that in most of the sites, NBPW has been found along with punch marked coins.

The chronology and distribution pattern of NBPW clearly indicates contact among South Asian countries between 700 B.C. and 100 B.C. and with Bengal from 300 B.C. to 100 B.C. Because some of the sites, which yielded the ware, are situated in coastal regions, it is possible that it was a maritime contact. Finding punch-marked coins along with NBPW is more significant because punch-marked coins are an indicator of a money-based economy. Their presence with NBPW strongly suggests that the ware was linked with trade. Hence, finding NBPW in coastal sites of Bengal, Orissa, Andhra and Tamil Nadu can only mean that the maritime trade network between these regions existed from 300 B.C. to 100 A.D. Guided by Evers' criteria, one can see that NBPW meets two requirements for the above network. Firstly, its presence in all the sites noted above suggests that the ware was included in a 'typical inventory of trading goods'. Secondly, because most of the sites were centres of Buddhism, it is possible that Buddhist religious establishments were linked with the traders (who in this case were the *Sreshtihs*). Hence, 'religious homogeneity of traders' is a definite possibility.

Rouletted ware

Rouletted Ware, found only in the shape of a dish, is so called because of 'rouletted' decoration of a variety of forms including triangles, diamonds, parallelograms, wedges, and dots. This type of pottery is usually wheel-thrown and slipped, with an unusually smooth surface. Its usual colour is grey and has a ring, which sounds almost metallic. It was first discovered at Arikamedu in South India. Since then, it has been found in Bangladesh such as Wari-Bateshwar (Fig. 1) and Mahasthan (Fig. 2), India (Chandraketugarh and Tamluk in West Bengal, Alagankulam and Karaikadu in the east coast of South India), Sri Lanka (Kantarodai, Mantai and Tissamaharama), Malaysia (Bukit Tengku Lembu), Indonesia (Kobak Kendal, Cibutak and Sembiran), Vietnam (Tra Kieu) and on the Red Sea coast (Berenike). Among other sites where it has been found, mention must be made of Sisupalgarh (India) and Myanmar (Beikthano). Although they are not maritime port sites, they too possibly indicate maritime contact because of their proximity to the seacoast (Sisupalgarh near Orissa coast) and location on the bank of navigable rivers (Beikthano on the Irrawaddy).

What is most significant about all the findings of Rouletted Ware noted above is that they are all comparable in form, texture, colour of the slip and general appearance with the earliest examples of the ware found at Arikamedu during the excavations of 1945. Initially, Wheeler tried to prove that Rouletted Ware was imported from the Mediter-

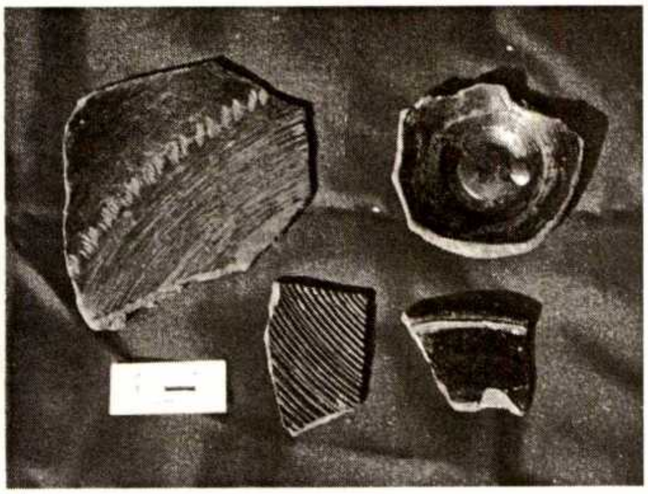

Fig. 1: Rouletted ware from Wari-Bateshwar, Bangladesh

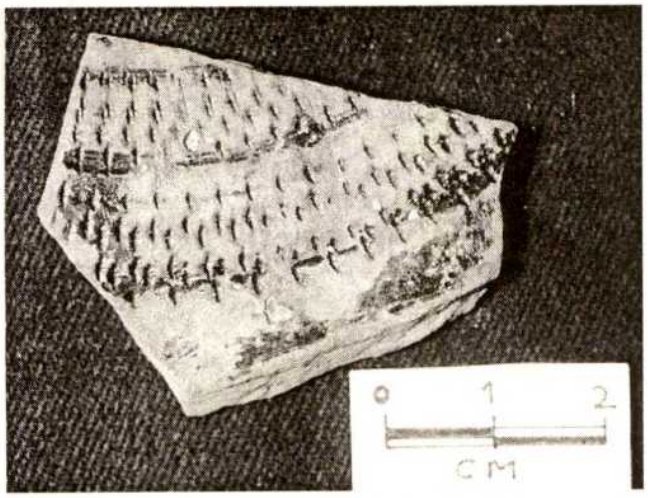

Fig. 2: Rouletted ware from Mahasthan, Bangladesh
Courtesy: S.S.M. Rahman

ranean region, while cruder varieties were locally made (Wheeler *et al.* 1946: 46; Wheeler 1947-1948: 200). Later, Begley attempted to show that the Rouletted Ware of Arikamedu was probably produced locally, but the 'rouletted' decoration was imported from the Mediterranean region (Begley 1983: 469, 478). However, recent scientific analyses have conclusively proved that Wheeler and Begley were wrong. In a Neutron Activation Analysis (NAA) for 20 rare elements performed by Ardika and Bellwood on nine rouletted sherds (two from Anuradhapura, two from Arikamedu, one from Karaikadu, three from Sembiran and one from Pacung), it was found that all of them are quite similar in composition. Hence they conclude, 'a single manufacturing source for all the samples listed, both Indian and Balinese, is a definite possibility' (Ardika and Bellwood 1991: 224). Two X-ray diffraction (XRD) analyses have so far been performed on Rouletted Wares. One of these, performed by Ardika and Bellwood on eight sherds (one from Sembiran, four from Anuradhapura and three from Arikamedu), has revealed that all contain essentially the same minerals, which are mainly quartz with traces of mica, muscovite, potassium feldspar and plagioclase feldspar. Basic composition of slip and sherd interior was also found to be similar, except for one sample from Anuradhapura, in which traces of hematite was also present in the slip. What is most significant is that the composition of the Rouletted sherd from Sembiran is not identical with the soil samples from the find spot and local sherds. Another XRD analysis, this time performed by Gogte (1997: 70-85), on Rouletted Ware and clay from Arikamedu, Alagankulam, Kottapatnam, Manikpatna, Sisupalgarh, Nasik, Tamluk and Chandraketugarh in India and Tra Kieu in Vietnam, showed that the Rouletted Ware from all the sites mentioned above is mineralogically identical with Rouletted Ware and the clay from Chandraketugarh. Furthermore, the XRD pattern of Nasik sample matched closely with the clay from Tamluk and to a lesser extent, with that of Chandraketugarh. From these results Gogte concludes, 'Rouletted Ware was produced at multiple production centres in the lower Ganga plain with the epicentre in the Chandraketugarh-Tamluk region of Bengal' (1997: 83). All the three tests point to a single conclusion. The 'single manufacturing source' indicated by the NAA and similar mineral content indicated by Ardika and Bellwood XRD analysis is further supported by Gogte's XRD analysis, which shows that the 'single source' is none other than lower Ganga plain in general, and Chandraketugarh-Tamluk region in particular.

Dispersion and spread of Rouletted Ware has still not been definitely known because archaeological excavations have yielded very little evidence in terms of dates. The little evidence that is available shows that South Asian Rouletted Wares were produced between 3rd century B.C and 3rd century A.D.

The chronology and distribution pattern of Rouletted Ware is a definite indicator of contact among South, Southeast and West Asian countries between 3rd century B.C. and 3rd century A.D. Since the commodity originated in Bengal, the region must have been the dispersing centre for the ware. Going back to Evers' criteria, there can be no doubt that Rouletted Ware featured in a 'typical inventory of trading goods'. Furthermore, because most of these sites were centres of Buddhism and because spread of Buddhism and trade was organically connected, it is possible to conclude that Buddhist religious establishments provided 'religious homogeneity of traders', very much like NBPW discussed earlier.

Knobbed vessels

Knobbed vessels are so called because at the centre of the inner surface of the base stands a conical knob, which is

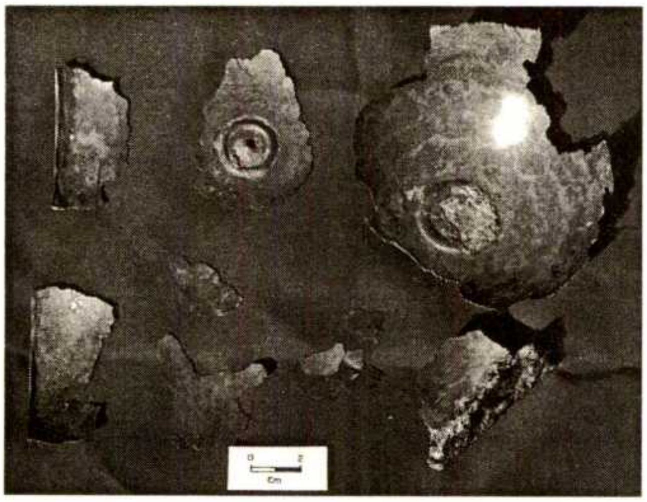

Fig. 3: Fragments of high-tin bronze knobbed vessel from Wari-Bateshwar

circumscribed by a series of concentric grooves or incisions. The ware has been found as earthen and high tin bronze bowls.

Fragments of two high-tin bronze knobbed vessels have been discovered at Wari- Bateshwar in Bangladesh (Fig. 3). Similar high-tin bronze vessels of knobbed variety have been found at Ban Don Ta Phet in west-central Thailand. Another bowl of this variety, but this one made of bronze, has been found at Than Hoa Province of Vietnam (currently preserved in the Musee Guimet, Paris). Glover believes that the Thai ware was imported to the country from Vietnam (1996b: 84, fn. 17).

In order to ascertain the origin of high tin bronze knobbed vessels, one needs to remember that the use of the alloy was known in South Asia because vessels made of the alloy (high tin bronze) has been found in sites such as the Bhir mound at Taxila in Pakistan, Adichanallur in the Nilgiri Hills and Coimbatore in South India. Strabo's *Geography* (15.1.67) vouchsafes that the use of the alloy was known in this region as early as the fourth century B.C. Although this evidence makes it possible to believe that high tin bronze ware could have been manufactured locally, as indeed Srinivasan is reported to have ascertained in an unpublished paper (Glover 1996a: 142), there still remains the possibility that it was imported from Southeast Asia, possibly Thailand. Argument in favour of Southeast Asian origin, as Glover has pointed out, is reasonable enough. For one, tin is not an indigenous metal of South Asia but is found in abundance in Thailand and Malaysia, where indeed quite a few sites have yielded high tin bronze wares. The sites in Thailand include Kok Khon in Sakorn Nakorn Province, Ban Chiang and Ban Nadi in northeast Thailand and Huai Pan near Chombung in Ratchaburi Province. Furthermore, the historical context of South Asian metallurgy also suggests that high tin bronze wares were imported in this region.

Another variety of knobbed vessel, made of earth, has been discovered in various sites in South Asia. These are Wari-Bateshwar in Bangladesh, Sisupalgarh and Harinarayanpur in the Indian states of Orissa and West Bengal, respectively, and Anuradhapura in Sri Lanka (now preserved at the site museum of Anuradhapura). A knobbed bowl in black granite has been found near Taxila in Pakistan (now preserved at the British Museum). Although the knobbed ware occurs in various fabrics, they all appear to be contemporaneous. Its distribution pattern indicates that the ware was produced in the Early Historical Period (*c.* 3rd century B.C. to 3rd century A.D.).

The function of knobbed vessel has intrigued scholars. Although it has been discovered in diverse contexts, scholars believe that the vessel was used for identical purpose, which was not secular or utilitarian such as cooking or serving of food. Rather, as Glover rightly surmises, they possibly 'served some special purpose for ritual and funerary use only'. He interprets the motif of the base knob and concentric circles as a mandala, 'a schematic cosmological symbol representing perhaps Mount Meru and the surrounding oceans'. He further points out that the vessels 'are witness to the adoption in Thailand, by some groups of Indian moral, philosophical and political concepts'. Although there exists no definite proof of exclusive Buddhist connection, its use at a time when Buddhism was in ascendance in South Asia does make Buddhist connection a possibility.

The chronology and distribution pattern of Knobbed Ware is another definite indicator of contact among South and Southeast Asian countries between 3rd century B.C. to 3rd century A.D. and also within South Asian countries. Particularly exciting is the indication of contact between ancient Bengal (Wari-Bateshwar), Thailand (Ban Don Ta Phet) and Vietnam. The concept of Knobbed Ware possibly spread from South Asia to Southeast Asia through Buddhism. On the other hand, high-tin bronze ware possibly came from Southeast Asia. Hence, distribution of Knobbed Ware indicates a two-way traffic between South Asia and Southeast Asia. If it was indeed an object of ritual use, it was not a commercial commodity. Nevertheless, the ware also demonstrates close proximity of Buddhism and trade guilds.

Stamped ware

Stamped Wares, shaped as bowls or cups with wide mouth, tapering sides and flat base, are so called because of motifs (birds, fish and stylised palmettes) stamped below their rims. The earliest specimen of these wares was found at Taxila. The excavator identified it as Hellenistic in origin

(Marshall 1951: 434). Stamped Wares with figural designs have been found at Sanghol (Gupta 1987: 100), Hastinapura Period IV (Lal 1954-55: 63) and Sonkh near Mathura. The Hastinapura wares have been dated 2nd century B.C. to 3rd century A.D. At Chandraketugarh in West Bengal, NBPW sherds have been found with stamped rosette designs. However, more distinctive is a black-and-red stamped ware sherd found at the same site. The decoration on it is seen on the interior just below the rim and is quite similar to Wheeler's Type 10 at Arikamedu (Wheeler *et al.* 1946: pl. LXXII, 6). It consists of is a row of stamped medallions with a bird motif within a square panel (*Indian Archaeology — A Review* 1957-58: 52). Stamped sherds of fine slipped grey ware have also been found at Alagankulam at the mouth of the River Vaigai in Tamil Nadu. Another stamped bowl has been reported from the Gedige site at Anuradhapura. Further specimen of the ware in Sri Lanka comprises several fragments found at Kantarodai. A rim sherd of a stamped ware (direct and everted with an un-thickened lip, glossy black in colour) has also been found in Indonesia, specifically at Sembiran on the north coast of Bali. On the inner side of the rim can be seen an impressed panel with a bird (possibly a peacock) motif (Ardika and Bellwood 1991: figure 3).

There is no doubt that the concept of stamped ware is Hellenistic in origin. The ware spread to different parts of South Asia by the land routes. Its presence at Chandraketugarh, Arikamedu, Alagankulam, Kantarodai and Sembiran clearly indicate maritime contact since all of these were seaports. Definitely, the ware was included in a 'typical inventory of trading goods'.

Footed ware

Footed Ware is a small dish with flaring out-turned rim and a base or foot shaped as a ring, displaying decoration below the rim (on the inner surface) and on the base. The scheme of decoration of these wares invariably consists of a ring of stamped ribbed leaves and a grooved circle or spiral at the centre.

Footed Wares have been found at Chandraketugarh in West Bengal, Arikamedu and Karaikadu on the eastern coast of south India and Shaikhan Dheri near Charsada in Pakistan. All these have been dated a century before and after the Christian era (i.e., 100 B.C. to 100 A.D.). Comfort (1991) and Slane (1991) have shown that Footed Wares are not indigenous to South Asia but bear close similarity with wares found in the Mediterranean world. It is possible that they entered South Asia through the land routes via Shaikhan Dheri. Begley believes quite correctly that 'the route of contact between Shaikhan Dheri and Chandraketugarh would have been inland through the Ganga plains, and coastal between Chandraketugarh/Tamluk and locations on the Coromandel Coast' (Begley 1991: 183).

Amphorae

Elongated jars with tapered bottom and handles attached to the sides, amphorae were used in ancient times as containers for transportation and preservation of edible materials, both liquid as well as solid. The edible materials include, wine, oil, vinegar, honey, olives, fruit, fish (preserved with salt or in oil), etc (Colazingari 1994: 154). Amphora fragments have been found in 26 sites in India, some of which are coastal while others are inland. Among these, 16 sites are in Gujarat and Maharastra. Two of the sites are in West Bengal (Chandraketugarh and Tamluk) and two others are on the East Coast of South India (Arikamedu and Karaikadu).

Amphora sherds found in India have been identified as imported as well as locally made. These fragments are not uniform in fabric and belong to a wide period in terms of making. The imported amphorae were manufactured almost exclusively in the Mediterranean world. Studies on Arikamedu amphorae have shown that many of these are Rhodian and Greek in origin. Although it is difficult to date amphorae because they were reused and because wine was stored in them for many years, the fragments mentioned above are believed to have been from the first century B.C. (Will 1987). However, sherds of the same ware found at Chandraketugarh and Tamluk in West Bengal have been identified as locally made, which were imitated from imported amphorae.

Amphorae are often cited as the most important evidence of maritime trade with the Mediterranean world. However, one needs to evaluate all evidences carefully before drawing a hasty conclusion. As Ray (1998: 70) has argued, presence of amphorae do not 'necessarily imply a Roman colony', as earlier proposed by Wheeler, because 'in the Early Historic Period, wine drinking was associated with the urban elite'. Hence, amphorae sherds should be taken only as indicative of consumption by local urban elite. The most conclusive argument against direct Mediterranean trade contact is the amphora sherds discovered in Bengal. It has been conclusively proved that they belong to locally manufactured wares and were not imported. The case against Bengal weighs more heavily because 16 out of 26 sites where amphora fragments have been found are in Gujarat and Maharashtra. Thus there can be little doubt regarding the importance of the West Coast in maritime trade with Mediterranean world (Ray 1998: 69). The design and motif of amphorae found at Chandraketugarh and Tamluk were possibly imported from Arikamedu, where such containers were imported as well as locally made. For its part, Arikamedu imported Mediterranean amphorae from ports situated on the western coast of South India, both by land as well as sea routes.

Glass beads

In the Early Historic Period, four traditions of glass beads developed in South Asia. These were, (i) the North Indian (centred in Ahichchatra and Kausambi), (ii) the South Indian (centred in Arikamedu), (iii) the West Indian (centred in Kohlapur) and (iv) the North-South Indian (distributed extensively from Taxila, Kausambi and Ahichchatra to Peddabankur and Dhulikotta) (Basa 1992: 93). The following examination focuses on maritime trade-related glass beads found in Bengal, which belong to the first three traditions.

(i) Of the two important types of beads belonging to the North Indian tradition, the one which is oblate and spherical in shape, opaque black in colour and inlaid with white stripes is important for this study because it has been found at Chandraketugarh and Harinarayanpur in West Bengal and Mahasthan in Bangladesh (Rahman 1999: 213). Chandraketugarh and Harinarayanpur beads have spiral grooves while Mahasthan beads show chevron design. Black beads with white spiral design have also been found in surface collections from Kausambi, and excavations at Narhan (north India, dated in Gupta period), Kodumanal (in Tamil Nadu, dated from *c.*100 B.C. to A.D. 200) and Brahmapuri (late Satavahana layers) (Basa 1992: 93, 97). This type of beads is rare in Southeast Asia. However, Basa reports the discovery of opaque black round beads with inlaid spiral grooves at Prasat Muang Sing in Thailand. Although white stripes are missing, it is possible that the filling in the grooves was originally white but has come off with passage of time. A similar bead was also found at Ban Chi Nam Lai, in Singhburi province of Thailand, this time from surface collection (Basa 1999: 32).

These findings make it possible to believe that beads belonging to the North Indian tradition were possibly transported from their production sites in Ahichchatra and Kausambi by land or river to Chandraketugarh for shipment to Thailand. From their presence at Mahasthan (an urban centre of political importance during this period), it is possible to surmise that these beads must also have been traded internally in Bengal and were possibly in high demand among the elite.

(ii) Beads belonging to the South Indian tradition, also known as Indo-Pacific beads, are usually monochromic, drawn and less than 6 mm. in diameter. Of different colours in which they have been found, opaque brownish-red and opaque orange-red are seen in greatest number. Peter Francis has dated Indo-Pacific beads from 3rd-2nd century B.C. to *c.* A.D. 1200. His research has shown that Tamils originally produced these beads in south India at Arikamedu, between *c.* 3rd century B.C. and 3rd century A.D. Later, they migrated to various parts of South and Southeast Asia to set up production centres. In Sri Lanka, Indo-Pacific beads have been reported from Mantai, dated between *c.* 1st to 10th century A.D. The beads have also been reported from Khuan Luk Pat in Thailand (dated from *c.* 2nd to 6/7th century A.D.), Oc-Eo in Vietnam (dated from *c.* 2nd to 6th century A.D.) and Kuala Selinsing in Malaysia (dated from 6th to 10th century). All these sites were production centres of Indo-Pacific beads. Analysing data drawn from above sources, Francis has shown that the original Tamil manufacturers migrated from Arikamedu to Mantai and then to Thailand, Vietnam and Malaysia (1996: 140-141).

Opaque orange-red beads, a variety belonging to the Indo-Pacific tradition, have also been found in Mahasthan region of Bangladesh. As these have not been dated, nor any research has yet been carried out on them, it is not possible to determine their exact relation to the scheme of penetration of Indo-Pacific beads discussed above. However, it is certain that Mahasthan was also connected to the trade network of these beads. The discovery of Indo-Pacific beads at Mahasthan is important, for they show that the network of beads evolved over considerable period of time, that the Tamils of south India were possibly involved in bead-making in Bengal and that beads featured in the inventory of trading goods of Bengal.

(iii) Among the beads of West Indian tradition, the gold foil type (in which a foil of gold is laid between two layers of glass) is important for this study because it is a possible indicator of contact with the Mediterranean world. Its most prolific use is noticeable during the early centuries of the Christian era. Although these are reported from several sites in South Asia, the quantity is very limited. These sites are Kausambi (between circa 300 B.C. and 200 A.D.), Nevasa (*c.* 150 B.C.-200 A.D.), Bhita mounds at Taxila (possibly from Kushana period), Brahmapuri (Satavahana period), Nasik, Kondapur, Nagra (1st century B.C. to 8th century A.D.), Ter and Karad (Satavahana period), Arikamedu, Paithan, Ahichchhatra (350 A.D.-750 A.D.) and quite a few others. In Bengal, the sites are Chandraketugarh, Harinarayanpur and Deulpota in West Bengal (Chakraborty 1998: 39) and Mahasthangarh in Bangladesh (Rahman 1999: 215). Two beads found in Mahasthangarh are short and cylindrical in shape.

There exist a variety of opinions regarding the origin of gold foil beads. Dikshit (1969: 57) and Singh (1980-81: 158-9) believe that these were made in South Asia in ancient times, but Sankalia and Dikshit (1952: 101) have argued that they were either imported or copied locally from foreign specimen. On the other hand, Peter Francis (1986: 54) has tried to show an Egyptian origin. Finally, Deo (1989: 219) has tried to show that the technique of making these beads was invented by the Romans and was introduced in South Asia by way of trade. If opinion in favour of foreign origin is accepted as that of the majority, gold foil beads clearly indicate maritime contact with the

Western world. However, these beads may have entered Bengal through south Indian ports such as Arikamedu.

Semi-precious stone beads

Beads made of various semi-precious stones such as agate, carnelian, onyx, amethyst, jasper, quartz, amber and crystal have been used as ornaments and amulets since pre-historic times. Etched beads, a special type of agate and carnelian beads with a white design etched on their polished surfaces, is an important indicator of trade between South and Southeast Asia during Early Historic Period.

Applying a paste of natural soda and crushed shoots of *kirar* (*Capparis aphylla*) on polished agate and carnelian beads, and then baking them on fire creates etching on the beads. The technique has been known only in South Asia since the Harappan Civilisation (3rd-2nd millennium B.C.). However, it fell into disuse, to be revived again in the Ganga Valley between *c.* 600 B.C. and 200 A.D. Relevant for trade in South and Southeast Asia is the period between 300 B.C. and A.D. 200.

Two sites in Bangladesh and four sites in West Bengal, India have yielded etched beads. These are Mahasthan (Fig. 4), Wari-Bateshwar, Bangarh, Chandraketugarh, Harinarayanpur and Deulpota. It should be noted that over a dozen etched beads have been found at Wari-Bateshwar. Etched beads have also been found in a number of countries in Southeast Asia including Myanmar (at Beikthano), Malaysia (at Tanjong Rawa, Kalumpang island, Kuala Selinsing), Indonesia (at Leang Buidane cave in Salebabu Island) and the Philippines (in Palawan Island). They have been found in Yunnan province in China, one in Tomb 13 at Shi Zhai Shan and another in Tomb 24 at Lijiashan. Dated to the Western Han period, one of the beads is of carnelian and is cylindrical in shape. However, those found in Myanmar and Thailand are of special significance to this study.

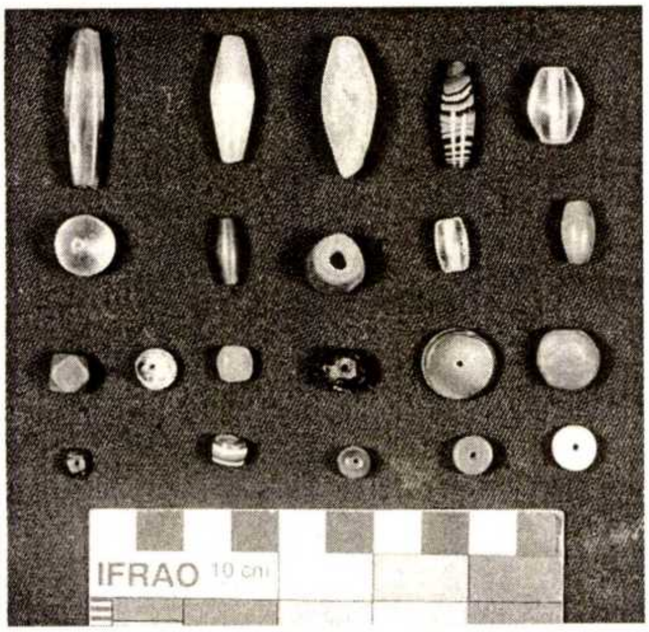

Fig. 4: Semiprecious stone beads from Mahasthan
Courtesy: S.S.M. Rahman

Discovering etched agate beads at Beikthano in Myanmar (Aung Thaw 1968: 66) is significant because the technique of etching agate beads with the help of *kirar* plants is not known in the country. As a matter of fact, the plant is not even grown in the country. Hence there can be little doubt that these beads were imported from South Asia.

In Thailand, etched beads have been found at Ban Chiang, Ban Tung Ketchet, Kok Samrong, U Thong, Krabi, Khao Sam Kao and Ban Don Ta Phet. The last named site has yielded over 50 beads with etched decoration. It has been conjectured that the Ban Don Ta Phet etched beads most closely match those of South Asia from 600 B.C. to 200 A.D. (Glover 1996a: 139). Because the technique of etching on stone beads was known only in South Asia, there can be little doubt that the Thai beads were imported from the above region. Bengal's maritime contact with Thailand becomes a proven fact when Glover (1989: 17) points out that long and barrel-shaped agate beads with two rows of white zigzags in marginal bands have been found both at Chandraketugarh and Ban Don Ta Phet. Hence, one can confidently include etched beads in a typical inventory of goods, which were traded between Bengal and Thailand.

Kharoshti-Brahmi records

During the first half of the first millennium A.D., a mixed script consisting of Kharosti and Brahmi letters was in use in parts of southern Bengal. As ascertained by Mukherjee (1990), Kushana merchants from Gandhara and Oxus regions, whose script was Kharosti (north-western Prakrit), migrated to lower Ganga Valley in Bengal and settled in Chandraketugarh and Tamluk region. Gradually they synthesized their Kharosti and local Brahmi (another form of Prakrit) letters to give rise to a mixed script known as Kharosti-Brahmi.

More than 135 inscriptions, either stamped or incised with Kharosti or Brahmi letters or mixed Kharosti-Brahmi letters, have so far been found on vessels (pots and jars), plaques and seals during excavations and explorations, mainly from Chandraketugarh, Bangarh, Hadipur, Ataghara, and Deulpota and Tamluk region in West Bengal. Among these, five seal and seal-impressions found at Chandraketugarh are especially significant because they display ships or boats.

The first seal-impression, dated 3rd century A.D., shows a ship with a mast ship bearing the inscription 'trapyaka' in Kharosti-Brahmi script. The mast has been placed amidships and two parallel ropes reach out to the stem- and sternposts. The top of the mast shows an inverted 'U' shape which has been described as a flying flag but could actually be the masthead cap. On the right edge of the ship stands a figure of a horse in profile, with its head facing the mast (Mukherjee 1990: 47). This seal has aroused the greatest interest because the *trappaga* type of vessels has also been mentioned in the *Angavijja,* a Jaina text dating back to the 4th centuries A.D. (but which contains even more ancient materials). The text devotes an entire section to ships, which it classifies by capacity: small, medium and large. The *trappaga* (or the *tappaka* as the *Angavijja* calls it) has been classified as a ship with medium capacity. The second seal-impression, dated *c.* 3rd century A.D., shows a ship with a mast ship with a stalk of grain on its right and a taurine symbol on its left (Mukherjee 1990: 45). The mast is tripod-based. It has a flag flying at the top, from where a pair of parallel ropes descends on each of its sides. The sail is rolled up with rings a little below the flag. Jana (1998: 248-49) may be quite correct in assuming that the ropes are part of rigging arrangement. Near the stern of the ship can be seen its steering device, which is a quarter-paddle. The third seal-impression, from *c.* 3rd century A.D., displays another ship with a mast ship with a flying banner but this time with a plant placed in a basket on its deck. An upturned conch is shown on the upper right corner (Mukherjee 1990: 47). The fourth, possibly from 2nd century A.D., shows another ship with a mast ship with a flying banner and an upturned conch symbol placed at the upper right hand corner (Mukherjee 1990: 48). The fifth seal, from *c.* 2nd century A.D., shows yet another ship with a mast, at the top of which flies a banner. Above the ship is a round object, which may represent the sun (Mukherjee 1990: 57). Quarter paddle used as steering device can also be seen in this seal.

In addition to the five seals and seal-impressions found at Chandraketugarh, another seal impression has been found in the district of South 24 Parganas, which displays a ship with two long masts and a rope ladder. Based on palaeographic features, the seal-impression has been dated 2nd century A.D. (Mukherjee 1990: 61).

The ship motif in all these seal and seal-impressions clearly indicate maritime activities. However, their relevance is much greater than that because seal inscriptions in the Kharosti and Kharosti-Brahmi scripts have also been discovered from U Thong in Lopburi province and Khuan Luk Pat of Krabi province in Thailand, Sembiran in Bali, Indonesia and Oc-Eo in Vietnam. Hence, there can remain do doubt that maritime activities indicated by the ship motif actually prove trade activities between Bengal and Southeast Asia. Furthermore, the figure of a horse in the first seal-impression, a stalk of grain in the second and a plant placed in a basket in the third clearly indicate that these items were included in the inventory of trading goods between these regions. Inclusion of the second and the third items is not surprising since Bengal has always been a fertile land. As for horses, it is likely that the Kharosti speaking traders shipped Central Asian horses to Southeast Asia through ports of Bengal.

Textiles

Because of its fragile and perishable nature, it is very difficult to obtain archaeological remains of cotton garments. However, evidence of cotton fragments and thread has been found recently at a burial site at Ban Don Ta Phet in central Thailand. Remains of textiles have been also found at Ban Chiang in southeastern Thailand. Specialists from the National Museum in Bangkok have examined the Ban Don Ta Phet materials and they have identified the fibre as *Cannobis sativa* which might have originated from the cotton plant from the cotton plant (*Gossypium* sp.) found in South Asia. The discovery is very significant because it indicates early textile exports from South Asia to Southeast Asia.

Maritime Trade Network

Having discussed ten types of archaeological artefacts, it is now necessary to look into the trade network of Bengal from 4th century B.C. to 4th century A.D. This I will now attempt with the help of Evers' criteria set forth in the introduction of this paper.

Ethnic or religious homogeneity of traders but diversity of partners

NBP, Rouletted and Knobbed Wares clearly show a close link between Buddhist religious establishments and the merchant class. As for amphorae, their occurrence does not prove the presence of Roman merchants in Bengal, since all the wares were locally made. However, Indo-Pacific glass beads raise the possibility of the presence of Tamil bead-makers in Mahasthan. Finally, all the Kharosti-Brahmi inscriptions prove convincingly that from the 1st century A.D. to the 5th century A.D., the Kharosti speaking Kushana trading community from the northwestern part of South Asia settled in lower Bengal for the purpose of trade with Southeast Asia.

Regular interaction between trading partners along definite trade routes

All the archaeological artefacts discussed above shed light on maritime trade contact of Bengal. NPW wares prove trade contact between the coastal sites of South Asian countries (Bengal, eastern coast of South India and Sri Lanka) from 300 B.C. to 100 B.C. Rouletted Ware is another definite indicator of trade contact among coastal sites of South Asia (Bengal, eastern coast of South India, Sri Lanka), Southeast Asia (Myanmar, Thailand, Vietnam, Malaysia and Indonesia) and the Red Sea Coast, between 3rd century B.C. to 3rd century A.D. Knobbed Ware is another definite indicator of maritime contact between South Asian (Bengal, Orissa and Sri Lanka) and Southeast Asian countries (Thailand), from 3rd century B.C. to 3rd century A.D. Hellenistic stamped ware spread to different parts of South Asia by the land routes and then spread to South India, Sri Lanka and Indonesia through the seaport of Chandraketugarh in Bengal. Footed Wares, another Hellenistic product, entered South Asia through the land routes, and then to locations on the Coromandel Coast through ports of Bengal (Chandraketugarh or Tamluk). On the other hand, amphorae do not indicate direct contact with the Mediterranean world. However, glass beads open a vast world of trading contact. First of all, Indo-Pacific glass beads indicate that Mahasthan was a nodule in the bead-trading network of South India, Sri Lanka and Southeast Asia. As for gold-foil beads, they indicate indirect trade with the Mediterranean world, via south Indian ports such as Arikamedu. It was only with the north Indian glass beads that Bengal played a substantial role, because they were transported to Thailand through Chandraketugarh. As for etched beads, Myanmar, Malaysia, Indonesia, the Philippines and China definitely imported them from South Asia, although we are not certain about the role played by Bengal. However, there can be no doubt about Bengal's role regarding the Ban Don Ta Phet etched beads and hence, maritime contact between Thailand and Bengal is established on concrete grounds. Seal inscriptions in Kharosti and Kharosti-Brahmi scripts definitely prove maritime trading contact of Bengal with Thailand, Indonesia and Vietnam. Finally, remains of textiles found at Ban Don Ta Phet and Ban Chiang in Thailand, is another indicator of maritime contact between South Asia and Thailand, where the role of Bengal is uncertain. All these artefacts indicate regular interaction. However, they do not indicate definite routes in terms of seaports touched on the way. For that, one has to turn to literary evidence. Nevertheless, this much is clear that maritime trade contact of Bengal was primarily with Southeast Asian countries. There is little evidence of contact with China while contact with the Roman world was vigorous but indirect.

Evolution of the network

Archaeological evidence discussed in this paper does not indicate the volume of trade in terms of quantity or monetary value. Nor have I included coins as one of the artefacts. However, there is a clear indication in terms of the number of commodities and partner countries. The trading network of Bengal began to expand during the Mauryan Period. Clearly, the peak period of production and trade was between the 1st century B.C. and the 1st century A.D., which corresponds with post-Shunga and early Kushana periods. There is a drastic fall after the 2nd century A.D. Was it because of the declining fortunes of the Roman Empire? It is doubtful, because during this period, the trade network was most intensive with South India, Sri Lanka, Myanmar, Thailand and Indonesia. Whatever Roman trade Bengal was involved in, passed through South India through ports such as Arikamedu. It was much less compared to the number of commodities and partner countries of Southeast Asia. Hence, the decline of trade was possibly not connected with the fall of the Roman Empire but with political conditions of South Asia or Southeast Asia. In the South Asian context, the major political change was the annexation of Bengal by the Guptas in early 4th century A.D. Does this mean that trading network of Bengal began to decline after Bengal came under the domain of the Guptas? We cannot say this definitely because, in order to do that, other materials and sources need to be examined. Summing up, one can conclude on the basis of archaeological evidence that the trading network of Bengal began to expand during the Mauryan Period, reached its peak during post-Shunga and early Kushana periods, and began to decline from the Gupta period. Furthermore, the trading fortunes of Bengal were tied up more intimately with Southeast Asian countries than with the Roman Empire.

Typical inventory of trading goods

The inventory of trading goods during the period under review included a number of export items from Bengal. These were NBP Wares, Rouletted Wares, Knobbed Wares, Stamped Wares, glass beads, etched beads, horses, grains and textile. Among these, NBP Ware and Rouletted Ware were luxury items, possibly meant for the use of the elite class. On the other hand, Knobbed Ware was meant for religious use only. Locally produced amphorae may have been used for exporting liquid and viscous food items. Considering widespread sugar cane production in Bengal during this period (Ray 1994: 108), it could be tentatively suggested that the food items might have included molasses. North Indian glass beads and horses were transit items, not produced locally. However, grains and etched beads were locally produced. Another locally produced item was textile, possibly Muslin, for which Bengal was indeed famous. Among the imported items, the inventory included gold foil beads and possibly wine in amphorae, both for the affluent class.

Distinct trading practices, customs and types of exchange (including typical ways of travelling and typical means of transport)

Archaeological evidence discussed in this paper throw little light on practices and customs of maritime trade in Early Historic Bengal. However, through the Kharosti-Brahmi inscriptions, information on means of transport in maritime trade can be gleaned. Seals and seal impressions show a certain uniformity regarding the physical aspects of the ships, indicating that most, if not all of the ships used for sailing in the high seas were fitted with one or more masts, rigging devices and rudder. The first seal impression has clearly inscribed on the 'Trapyaka', which, when read in conjunction with the *Periplus* (section 44), evidently refers to Trappaga class of ships.

Market-place system

An evaluation of existing market-place system implies identification of the process in which the commodities, produced at production centres, reached the consumers through traders. Industrial production centres in Early Historic Bengal, as indicated in the archaeological evidence, were geared to producing ceramics (NBP Ware, earthen Knobbed Ware, Rouletted Ware, Stamped Ware, Footed Ware, amphora, etc.), beads (made of glass and semi-precious stone) and textiles. Production of varied ceramic wares indicates habitation of large number of potters, while production of beads indicate a different class of skilled craftsmen. Possible presence of Tamil craftsmen implies that inland urban centres such as Mahasthan were habitations of numerous nationalities. As for textiles, one can surmise the existence of weavers. There may have been other centres producing molasses. Regarding trading community, clear indication exists concerning the Kushana traders. In all probability, they dominated the horse and rice trade and were very affluent. Similar communities, local or foreign, may have been involved in trading other commodities as well. Many of the products discussed here (NBP Ware, Knobbed Ware, Rouletted Ware and beads) were luxury items. Hence, the presence of a sizeable affluent community can possibly be deduced in the countries that produced and imported these items. Presence of essential commodities such as rice and textile, indicate that Bengal was possibly producing in excess of her home-market demand which in turn indicates that the less affluent section of the population had enough to fill their stomach.

There is very little indication in the artefacts discussed above to show how the traders procured the commodities from local market. Presence of Kushana traders indicates that foreigners may have transacted a sizeable portion of trade and commerce. Since trade with the Mediterranean world was indirect, it is possible that there existed a number of intermediaries between the producers and the consumers.

Conclusion

Archaeological evidence alone cannot give a complete picture of trade network in the Early Historic Period. However, archaeological evidence proves very clearly that the prime focus of the trade network of Bengal was Southeast Asia; Roman trade was indirect and smaller in volume; trade with China was also indirect and possibly marginal in terms of monetary involvement. Distribution pattern of the archaeological materials shows that Bengal had established a well-organised network within the region, with other territories in South Asia and Southeast Asia. Furthermore, one learns about a completely new inventory of trading commodities. The peak period of trade was possibly between 100 B.C. and 100 A.D., falling between the two great dynasties of the Mauryan and the Guptas. Further research in this direction will possibly reveal an unknown vista in the hitherto known history of Bengal.

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The Role of Local Trade Networks in the Indian Subcontinent during the Early Historic Period

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Abstract

A variety of trading and non-trading activities utilized and created land-based trade routes during the Early Historic period. The presence of local trade routes in the Indian subcontinent is documented by a common corpus of items such as fine ceramics, coins, and marine shells in archaeological sites. Archaeological fieldwork consisting of systematic survey at both the town-sized site of Kaundinyapura and the city of Sisupalgarh enables a detailed examination of the way in which trading networks provided goods that were part of the basic repertoire of household items

Introduction

Much has been written about the exchange networks of the Indian Ocean starting in the late first millennium B.C., when the Mediterranean, the Indian subcontinent and Southeast Asia sustained long-distance contacts. Trading-sites around the Indian Ocean have received special attention, as they were the places where foreign cultures met and where goods were exchanged. Marine ports offer a particularly dramatic scenario for the contemplation of foreign contact, since such contact could be achieved directly by traders sailing from the coasts of the Red Sea and the shores of Arabia to the Indian subcontinent. The long-distance trade which took place around the Indian Ocean during the Early Historic period (c. 3rd century B.C. to 4th century A.D.) was principally manifested in exotic commodities as documented by literary and archaeological sources (Begley and De Puma 1991; Ray and Salles 1996). A group of specialist traders is identified as responsible for the transport and exchange of goods across the oceans, and it is likely that specialized merchants continued to care for the shipments of exotica once they reached port (Casson 1989; Liu 1988; Will 1996).

While oceanic long-distance trade was almost exclusively devoted to high-value goods, the trade links between ports and the hinterland were of an entirely different nature: once on land, the movement of exotic goods inland to consumers took place along the same physical routes which were used to transport ordinary goods for local use such as agricultural produce, household implements, and domestic animals. These inland trade routes were used not only by traders moving their wares, but also by many different types of people who travelled for religious pilgrimages, military activities, and family relationships. The large-scale movement of people and goods indicates that hinterland-port relations were part of a widespread, thoroughly developed series of trade relations which thrived because of local needs.

From the point of view of port sites, hinterlands have a dual purpose: they are the source of desired exports, and a destination for imports. The presence of a trade hinterland as the source of desired goods is mentioned by the classical authors, whose limited descriptions indicate that inland towns are both the manufacturing-place of goods and the collection-point for goods coming from even greater distances. The *Periplus of the Erythraean Sea*, a merchant's document of the first century A.D. written in Greek, observes that the town of Ozênê (Ujjain) produced semi-precious stones and cloth of all kinds as well as being the collection-point for nard from the Himalayas (Casson 1989: 91). Being written from a Mediterranean point of view, the *Periplus* shows a merchant's concerns for profitable items for long-distance exchange, and says little about other types of trade goods which were primarily for local use.

Studies of exchange patterns from other parts of the world illustrate that while unusual items of commerce may not be equally accessible to all groups of people, they must physically travel along the same routes. In medieval Europe, saints' relics travelled via the same mechanisms as other elite commodities: by trade, gift or theft (Geary 1986). The fact that these relics had very special destinations (kings and churches) and a unique cultural significance relative to other items of elite wealth did not matter with regards to their circulation in the society. Mary Helms (1979) provides another example of the paths which elite and common goods travel, when she discusses the *krun* game of Panama as a social occasion which brought together traders of all types of wares. Similarly, in the Early Historic period we see numerous opportunities for trade exercised at the local and regional level in connection with Buddhist practices (Ray 1986; Liu 1988) or political contact (Lyonnet 1994).

The distinctions between local, regional and long-distance trade can be considered to a certain extent artificial divisions along a continuum, since long-distance exchange can be achieved as the result of numerous small-distance transfers.[1] However, an examination of these levels of exchange and their practical effects can help to productively divide the discussion of exchange into coherent units of analysis. For the purposes of this article, the following definitions will be used (following Smith 2001a: 16). Local trade will be considered to be that which can be accomplished within a one-day travelling range by the fastest available means of transport. Local trade can be accomplished with very little infrastructure, since the traveller (either the buyer or the seller) does not spend time away from home and therefore does not require lodging facilities, overnight halts, or other investments in a non-home locus.

Intermediate, or regional, trade takes place within cultural units, utilizing the basic means of transport but often in a more efficiently organized manner or on a larger scale, such as with caravans of pack animals. Travel time includes nights spent away from the voyager's home and thus requires travellers' facilities such as caravanserais or the maintenance of personal hosting relations. Finally, long-distance exchange takes place across geographically-large expanses in which transport time is on the scale of weeks or months; such exchange may cross cultural or linguistic boundaries, but the effects of such boundaries are mitigated by specialized traders who negotiate contacts and transfers (Curtin 1984). Long-distance exchange may occur either as the result of single lengthy voyages (e.g. by sea as between the Mediterranean and India), or as the cumulative effect of successive local and regional transfers.

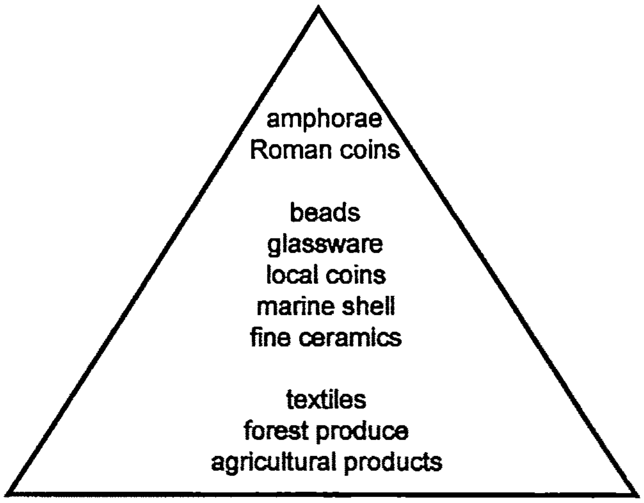

Fig. 1: Goods utilized at Early Historic sites in the subcontinent

Items of Local and Regional Exchange in the Subcontinent

The archaeological record permits us to examine the variety of items manufactured and traded *within* the Indian subcontinent. The pyramidal diagram (Fig. 1) indicates three types of trade goods found in Indian archaeological sites of the Early Historic period. The goods are listed in the order of the frequency of use, with the items at the top of the 'pyramid' being the most rare and representing goods arriving in the subcontinent as the result of Indian Ocean trade activities. The goods in the middle category are those found in almost all sites of the Early Historic period in India, and which are derived from raw materials available in the Indian subcontinent. The final category represents the types of goods which probably constituted the largest proportion of inland trade. These goods were traded between sites for domestic use, but also became part of the long-distance trade network because items such as forest products (skins) and agricultural products (wool, cotton, spices) were desired goods for overseas trade. However, these goods are perishable, so only indirect evidence of the production and consumption of these goods is usually found in archaeological sites. The most likely items to be found archaeologically are located in the middle category, consisting of durable goods whose distribution appears to be limited to the Indian subcontinent. Excavation reports from Early Historic sites throughout India consistently list a common catalog of items such as marine shells, ornaments, fine ceramics and coins. The widespread appearance of the same types of artefacts is due to two factors: the transfer of actual items, and the transmission of ideas and styles.

One particularly striking proof of the exchange of material items throughout the subcontinent in this period is found in the use of marine shells (Fig. 2). The large

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[1] In this paper, I am using the words 'trade' and 'exchange' interchangeably, to signify the transfer of goods from one party to the other. While attempts to separate the subtleties of these two terms have been made (Ray 1993), achieving these distinctions consistently given the interchangeable use in general discourse means that it is probably more straightforward to consider them as two terms for the same thing, and to be specific about social implications when they can be discerned.

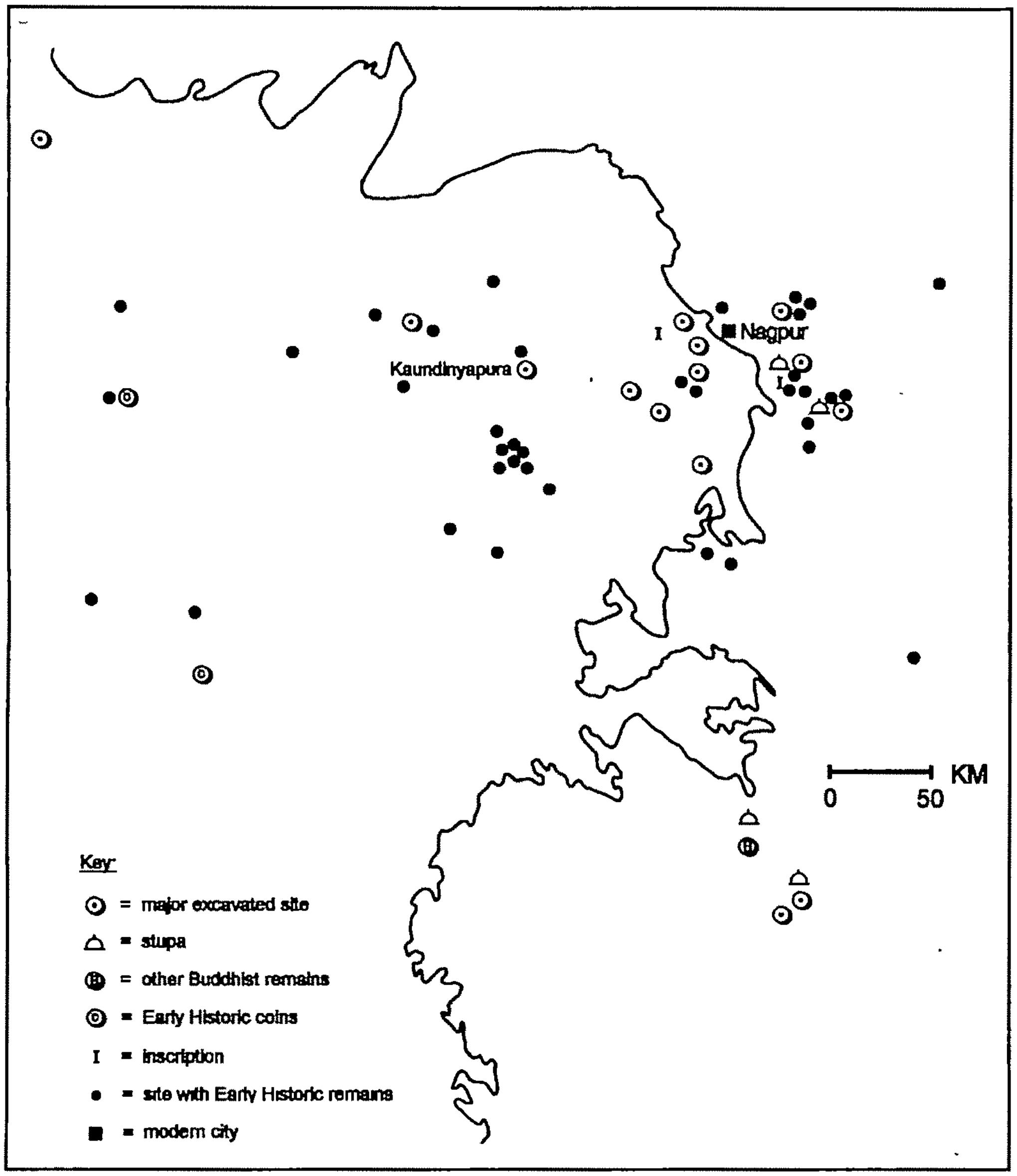

Fig. 2: Sites of the Early Historic period (3rd century B.C. to 4th century A.D.) for which substantial information is available about cultural assemblages. The information is compiled from excavation reports and IAR

gastropod *Turbinella pyrum* has a natural distribution on the southeastern and northwestern coasts of the subcontinent (Nagappan Nayar and Mahadevan 1974). However, it is found in many inland sites of the Early Historic period, in both whole and fragmentary form. The use of this shell appears to represent an interest limited to the Indian subcontinent: in a catalog of the types of marine shell found at archaeological sites in the Mediterranean, there is no mention of the *T. pyrum* species (Reese 1991). In the sites of the subcontinent, this marine shell was modified in a number of ways: whole shells were hollowed out for use as trumpets, but the shell was mostly used for making bangles and ornaments (Smith 1996). The discovery of shell fragments far in the interior indicates that whole shells were transported rather than the fragile bangles; because the shell is quite distinctive, it is easy to recognize fragmentary portions in the archaeological record. As the shells of the minimum appropriate size for making bangles represents at least 150 g, we can begin to see that regional exchange was not limited to very small items. The recovery of marine shells in the interior of the subcontinent indicates the transfer of both raw materials and technology and expertise, since the manufacture of bangles from the shell requires skill in breaking the interior of the shell, and in sawing the upper rounded portion of the shell into bangles (Kenoyer 1983).

Other types of ornaments, such as beads and ear-spools, were also widespread in the Early Historic period. The existence of prevailing bead styles indicates that both actual beads and information about fashion circulated in the inland trade networks. Beads made from rare or distant raw materials, such as lapis lazuli, are sometimes recovered (e.g., at Mangalkot, Ray and Mukherjee 1992; and at Nevasa , Sankalia *et al.* 1960). At the same time, a consistent style of beads is noted from materials which are widely available, such as agate and freshwater shell. The presence of unfinished beads at many Early Historic sites suggests that beads were locally made, perhaps because the grinding and polishing of stone beads was a labour-intensive but not particularly skilled task.

Another indicator of flourishing trade in the subcontinent is found in the use of coins. As with the appearance of ornaments, the widespread distribution of coins indicates several levels of exchange activity, in the trade of physical coins as well as the understanding of the concept of coinage as a way to facilitate trade. The use of coinage dates to the fifth century B.C., when punch-marked coins began to be utilized in northern India. These earliest coins are metal strips or flanges onto which symbols have been cold-hammered. Later, these punch-marked coins were replaced by die-struck coins. The distribution of coins is varied: some coin series, thought to be 'local' issues, are found in limited areas. Other coin series, such as the Indo-Sassanian Kshatrapa coins, are found far from the homelands of the rulers associated with their issue (Shastri 1992b). Although the role of precious-metal coinage in the economy of the time is debated, it is argued that the Indo-Sassanian silver coin type is widespread due to political agents, even outside Kshatrapa dominions, who reproduced these coins because of their acceptance in trade (Jha 1991; Kumar 1986).

The practical use of coinage is indicated by the recovery of base-metal and copper issues which circulated in the Early Historic period. The presence of a large number of such coins throughout the subcontinent, when each type often had a restricted distribution, suggests the use of coinage in the fully modern sense as a standard of value and as a medium of exchange (Lahiri 1991; Mukherjee 1991). Coinage, with its depiction of portraits, script and symbols had the possibility of conveying multiple meanings, whether or not it was also utilized as a general-purpose money. Examples of the use of the coin-form as a symbolic token includes the duplication of metal coins in clay for use as ornaments, frequently known as terracotta bullae (for example, at Ujjain; see Gupta 1991; further examples are noted in Ray 1985). The variety of coin types and their distributions is a strong indicator of the levels of constant contact between regions, and the transfer of both material objects and information. In the distribution of coins, we have evidence both for the recognition of common forms and symbols, and of the presence of a market system in which coins facilitated exchange.

Other types of goods, such as ceramics, also provide evidence for the widespread distribution of prevailing styles as well as the transfer of actual objects. Many sites of the Early Historic period contain well-made ceramics, such as the Red Polished Wares recovered at many sites in the western subcontinent, and Rouletted Wares primarily distributed on the eastern coasts of India (for maps of distributions, see Begley 1991). There is clearly a similarity of ceramic forms and fabric throughout large regions of the subcontinent, though there are two potential difficulties in recognizing ware types and forms in published excavation reports. First, the number of vessels or fragments of vessels recovered from individual sites is not consistently noted, so that it is difficult to compare the frequency of use of particular forms from site to site. Secondly, terms such as 'Red Polished Ware' or 'Rouletted Ware' are often used as labels to identify a wide range of pottery within a site or region, a practice which obscures the variation between wares. Still, excavation reports do present a valuable opportunity to establish a presence-absence comparison between sites.

The first extensive description and discussion of Red Polished Ware was undertaken by B. Subbarao, who described this ware as having a fine levigated clay, fired to a uniform brick-red colour and having an outer surface which is polished with colours ranging from lacquer red to a dull brown (Subbarao 1953: 56). Found at many sites in Gujarat, especially in Saurashtra, this ware has been consistently associated with excavated strata ranging from the 1st to 5th centuries A.D. Subbarao's characterization of this ware indicates that it occurred in a number of fairly distinct forms: a thick spout with a narrow aperture commonly known as a 'sprinkler' (tall, thin necks with everted flat rims); fancy everted rims with external grooves, and shallow saucers (Subbarao 1953: 58; see also Liu 1988: fig. 2). Subsequent investigation of this ware type has increased the number of recognized forms, with Orton claiming to distinguish up to 160 stylistic variations in jar rims alone (Orton 1991: 46).

In the south and east of the subcontinent there are a group of wares known as Rouletted Wares, which are well-made ceramic forms with a rouletting or chattering design (for a summary of locations, see Ramachandran 1980; Walker and Santoso 1977-78). V. Begley characterizes this ware as being entirely different from the fine wares of the Western coast, with a very limited range of styles in a fabric which is predominantly gray (Begley 1991). The only shape in which this ware is found is a flat-bottomed dish with a distinctive pattern of concentric circular bands of tiny indentations in the interior (Krishna Deva in

Wheeler *et al.* 1946: 45). These wares have attracted attention not only because they are distinctive and well-manufactured, but also because of speculations that they were either direct Mediterranean imports, or made in the subcontinent in imitation of Mediterranean wares (e.g, Subbarao 1953; Begley 1991; Begley 1994). The debate is mostly grounded in stylistic analysis, since the chronology of the Indian archaeological sites is not well-enough controlled for fine-scaled breakdowns of chronology. However, several important observations can be made. First, the presence of a total artefact assemblage which contains many items and material elements not found outside of South Asia indicates a culture with sustained inventive capacity, so that the appearance of a new ceramic type is not necessarily the result of imposed exterior 'influence'.

Secondly, the appearance of Red Polished Ware and Rouletted wares in the Early Historic period do not represent the first occurrences of widespread ceramic styles. Earlier distributions of other fine wares include Northern Black Polished ware, known from the Ganga valley, and black-and-red wares associated with the Megalithic cultures of central and southern India. Finally, there is a long tradition of ceramic proficiency in the Indian subcontinent, utilizing a variety of sophisticated firing techniques, decoration, and form, so that it would not be out of place to regard the phenomena of 'Red Polished ware' and 'Rouletted ware' as being simply one aspect of a long ceramic tradition. As Orton observes for the Red Polished Ware of Gujarat, all of the forms (with the exception of the sprinkler and certain globular jars) can be found in the coarser associated wares of the Early Historic period (Orton 1991: 47). Increasingly, Rouletted Ware is also being seen not only as a local Indian product, but one which was then exported from the subcontinent into the wider world of the Indian Ocean as well (Ardika *et al.* 1993, 1997; Krishnan and Coningham 1997; Gogte 1997).

The archaeological evidence from the subcontinent indicates that many types of goods were manufactured, both from locally-available materials (such as clay in the making of ceramic vessels) and from non-local materials (as seen by marine-shell debris found hundreds of kilometres inland). In the analysis of early trade routes through which goods were transported, the identification of the production strategies utilized in the manufacture of finished products is as important as the identification of the raw materials used. The production of items for local and regional exchange within the subcontinent was the result of a variety of manufacturing techniques. The archaeological record provides evidence for specialized manufacture in items such as shell bangles and metal coins, where the manufacture of finished items could have been accomplished by single individuals or small teams. Evidence for the large-scale manufacturing of goods in this period is limited, though it appears that the concept of the large-scale organization of production was recognized as indicated by inscriptions which mention 'guilds' as donors to religious institutions (Ray 1986).

The guilds mentioned in the cave-inscriptions of Western India include weavers, potters, bamboo-workers, oil millers and 'dealers in water machines' (Ray 1985). The presence of what appears to be organized corporate bodies identified as makers of particular goods or holding market specialties indicates that certain craft activities were carried out on a scale of surplus production beyond household needs. Specialized manufacture implies trade, because the products of that manufacture were to be produced in sufficient quantities to be traded away from production areas. At the same time, there is also evidence for relatively unskilled and repetitive labour, such as that utilized in the manufacture of beads. The use of unskilled labour is also implied in the many mundane steps of the production process of ceramics, terracottas and clay ornaments: acquisition of fuel and clay, initial preparation of raw materials, and transportation of the finished products. Many of the trade items documented by the historical and archaeological record, including textiles and agricultural commodities, could have been produced at the household level utilizing surplus family labour. Households would have engaged in trade directly, through barter or sale, and may also have seen the results of their production pooled for exchange by guilds and merchants acting as middle-men.

The Mechanisms of Exchange in the Subcontinent

The distribution of goods such as coins, shell objects, and ornaments show that trade involved the transfer of 'information' and common values as well as the exchange of actual objects. The uniformity of material culture reflects other trends towards cultural unity in the subcontinent in the Early Historic period, such as the development of Buddhism and Jainism. The spread of Buddhism is manifested in the widespread appearance of similar iconography and a distinctive architectural mode in the Early Historic period. Starting in the 2nd century B.C., the simultaneous appearance of the Buddha image at sites as widespread as Nagarjunakonda and Mathura (about 1500 kilometres apart) signals the presence of travelling skilled artisans (Wayman and Rosen 1990). The similarities of form and design in Buddhist religious establishments such as Bharhut, Sanchi and Amaravati further indicate that artisans traveled the same routes as traders (Fig. 3). Nor was long-distance religious travel restricted to artisans: records of donations indicate that patrons of Buddhist establishments, from kings to commoners, also travelled from their residences to shrines. Inscriptions from the cave temples of western India and from the stupas at Sanchi in the north and Amaravati in the south indicate that ordinary

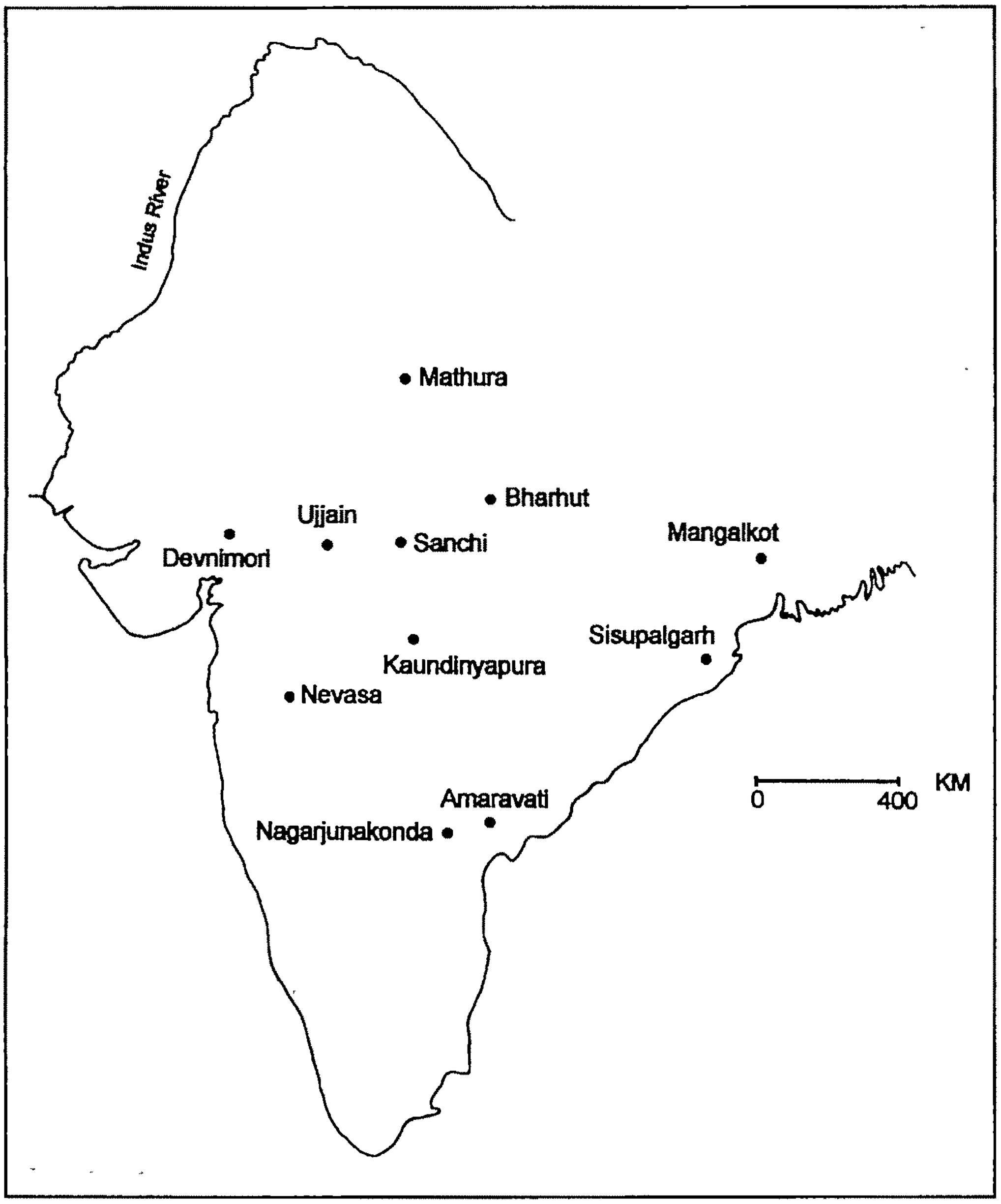

Fig. 3: Sites mentioned in the text

persons made pilgrimages; the inscriptions at Sanchi, which mention the donors' homes, show that people travelled substantial distances (Bajpai 1978).

In addition to the travel along local routes indicated by the trade of goods and the fulfilment of religious duties, many other circumstances compelled and invited travel in the Early Historic period. Rulers and their armies travelled about the landscape in cycles of conquest and administration. Periodic natural disasters such as floods and droughts may also have prompted the migration of individuals and families. Specialized occupations, such as herding, favour an itinerant lifestyle. Other occupations, such as iron working, may have likewise been mobile professions in areas where villages were too small to support full-time specialists. These specialized craftspeople would also have engaged in trade and transport activities for the collection of raw materials and for the distribution of finished products.

However, all of these movements of people and goods took place despite two very strong deterrents to travel: natural constraints and political constraints. Natural constraints to travel took the form of forests, difficult terrain, and seasonal extremes like monsoon rains (e.g. see Deloche 1980). Cultural constraints occurred in the form of political instability during a time when the Indian subcontinent had no centralized political entities to provide internal security or protect trade routes. Between the short-lived Mauryan polity of the 3rd century B.C. and the relatively widespread Gupta 'empire' of the 4th century A.D. there was no large-scale unified government, and the political landscape of the subcontinent can be characterized as one composed of regional dynasties, with shifting control over territory and resources (Mirashi 1981). The ability of these dynasties to create surplus wealth was limited, so that there was little provision of the kind of infrastructure acknowledged as essential for trade in the modern world such as good roads, communications networks or security (Plattner 1989). It appears, thus, that trade took place on a highly flexible basis, in which traders and travellers exchanged information about appropriate trade routes, travelled in groups for safety, and altered their schedules to avoid times of seasonal weather extremes.

The flexibility of travel schedules under these types of natural and political conditions is illustrated by Early Historic written documents. Starting in the 2nd century B.C. the popularity of the Buddhist ethic was manifested through the construction of monasteries; these monasteries were to be inhabited during the rainy season, so that monks and nuns would have a home during the time when travel was impractical (Barnes 1995). Early European travellers' reports for the subcontinent similarly cite numerous examples of multiple routes: the specific route for any given journey was calculated on the basis of the current political regime in the region, the level of perceived banditry, the height of rivers and the location of fords, and hospitable places for overnight stops (e.g. Colebrooke 1790). Thus, the challenging conditions of both the physical and the political landscape were factors in establishing the routes and times of travel, but did not serve as deterrents to movement.

Regional and Local Exchange at the Site of Kaundinyapura

Archaeological and historical evidence indicates that towns and villages in Early Historic India were the focal-points of a very active trading environment. Any site could participate in trade through the production of some kind of tradable surplus, such as agricultural produce, raw materials, or finished products. At the same time, these towns and villages were stopping-points along the routes of travel for pilgrims, traders, and political figures. Two recent survey projects enable us to assess the extent to which local exchange was a significant component of economic activity.

The first project was carried out at the site of Kaundinyapura in central India, a site of approximately 6.5 hectares on the banks of the perennial Wardha River. The site today is still relatively undisturbed, enabling its ancient setting and the site layout to be discerned. A limited excavation in the 1960's provided an indication of the range of materials which could be expected (Dikshit 1968). In 1994 and 1995, a systematic surface survey and collection was carried out to document the way in which this town-sized site participated in the trade networks of the subcontinent, the way in which ordinary inhabitants had access to trade goods, and what they produced to finance their consumption (Smith 2000). A total of 169 surface sample units were collected at Kaundinyapura, with the most abundant category of artefacts consisting of ceramics. These ceramics indicated contact between the inhabitants of Kaundinyapura and other sites in the region, in both stylistic similarities as well as in material composition. In terms of stylistic similarities, Kaundinyapura contains Early Historic vessel forms also seen at contemporaneous sites in the region (i.e. within two hundred kilometres). One particularly striking type of ceramic consists of a high-fired, fine-paste ware which appears almost exclusively in a large-diameter shallow bowl form. The form and finish of this ceramic are identical to other contemporary sites in the region (Smith 2000). However, limited laboratory tests show the clay composition to be distinct from other sites and matches the profile of clay sources near Kaundinyapura, indicating that the Kaundinyapura ceramics were the result of a local manufacturing process (Smith 2001a: 85-87). Other items indicative of a local ceramic manufacture included bricks and tiles.

Another ceramic type which indicates contact between Kaundinyapura and other sites in the region is the micaceous ware. This ware consists of coarse, pale-red clay which contains up to 40% mica in the body. Although this ware is very fragmentary it appears to represent only one shape, that of a large form, probably a jar, with an everted plain rim. The presence of visible mica in some ceramics at Kaundinyapura is again indicative of the physical transfer of goods in the form of either finished products or raw materials. The geological formation of the Kaundinyapura area is entirely basaltic, being located at the eastern edge of the Deccan Basalt Province which covers most of west-central India. Geological consultations indicate that the nearest mica sources are located at least 100 kilometres away and to the east, beyond the edge of the Deccan basalts. In addition to ceramics, the surface survey recovered querns, grinding stones, and paving stone fragments made of sandstone, which like mica is only available at a minimum distance of 100 kilometres from the site. The location of Kaundinyapura with reference to other contemporary sites in the region shows that there was an abundance of sites in the area where the edge of the Deccan basalts met the older geologic formations of the eastern subcontinent (Fig. 4).

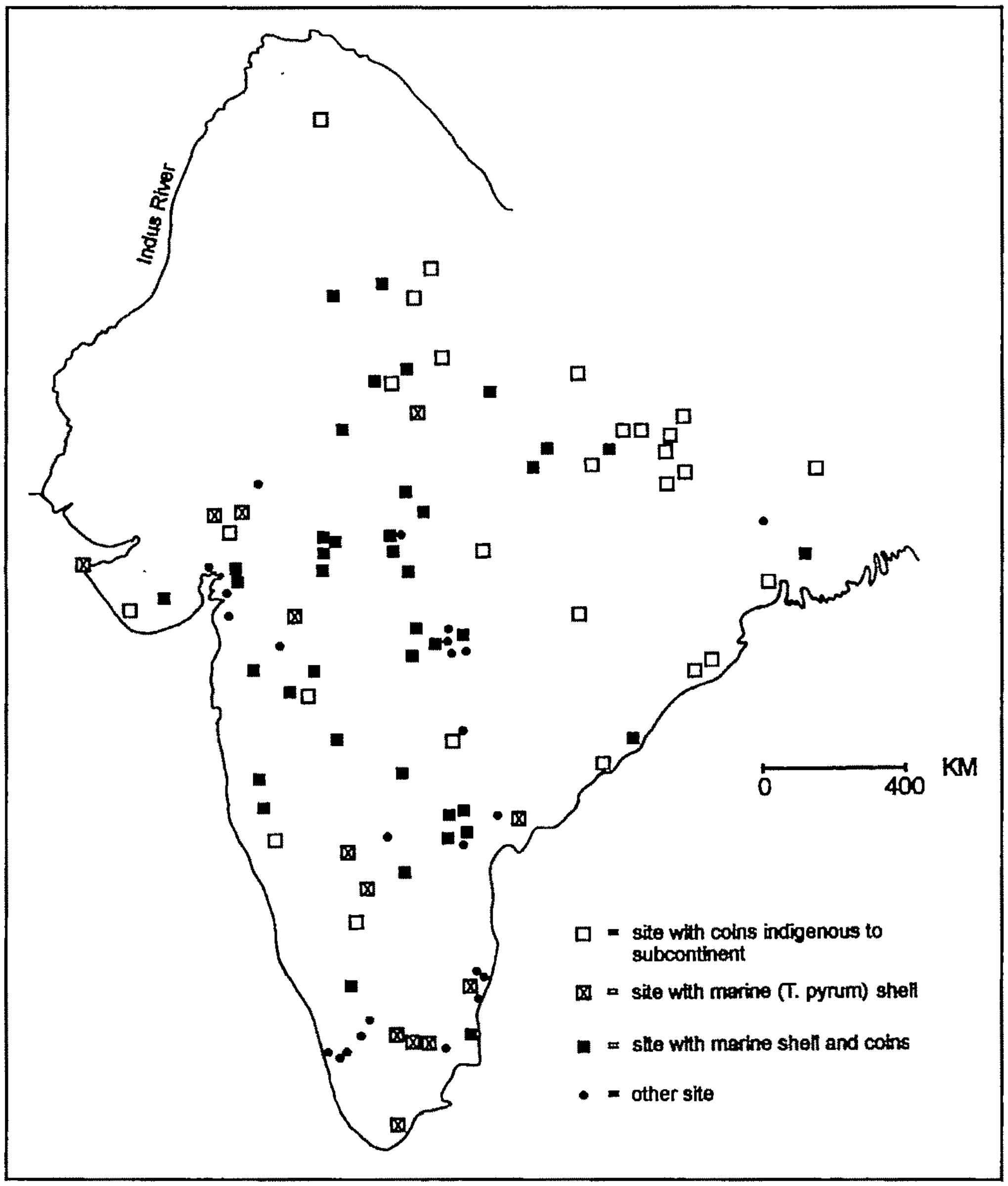
Indus River
0
400
KM
□ = site with coins indigenous to subcontinent
☒ = site with marine (T. pyrum) shell
■ = site with marine shell and coins
● = other site

Fig. 4: Kaundinyapura and nearby Early Historic period sites. The area to the left of the line indicates the zone of the Deccan basalts. Information was gathered from excavation reports and from other sources such as IAR

While it would be easy to propose that these sites simply traded products from their immediate environments as a matter of economic efficiency, it appears that more complex social factors were part of the exchange process. At Kaundinyapura, basalt is readily available near the site and could have substituted for sandstone as a grinding tool. Similarly, the small technological advantage achieved by adding mica to pottery can also be realized using other materials (such as burnt or unburnt freshwater shell; Rice 1987:407). The value of sandstone and mica to the inhabitants of Kaundinyapura may have extended beyond their physical properties. Significantly, these items were distributed throughout the site, suggesting that they were items to which many persons had access. In addition, the apparent domestic nature of many of the non-local items, such as sandstone grinding tools, indicates that there was substantial trade in daily-use goods. These materials may be considered primarily 'utilitarian' but they also carry symbolic value as evidence of contact between people who traveled around the landscape for kinship, political, or religious reasons (Smith 1999). This factor is another way in which regional and local trade differs from exotic long-distance trade, in that the participants of the exchange network were not merely elites and specialized traders, but rather, a large percentage of households.

The materials at Kaundinyapura indicate that there was thriving local and regional exchange in a wide variety of materials, but that long-distance trade was limited to only a few items such as marine shell. There are almost no documented occurrences of Rouletted Wares in central India, and none were recovered among the 32,000 ceramic sherds analysed for this project. Sixteen percent of the total count of ceramics were of a bright red colour, red-slipped and of finely-levigated clay, but none of the shapes typically associated with the Red Polished Wares of the western coast were encountered at Kaundinyapura. Kaundinyapura and its neighbours shared their own tradition of finewares; it is not surprising that pottery and other durable goods were made of local materials rather than transported hundreds of kilometres from the coasts. The trade networks of central India were constructed primarily to meet local demands with regional materials, and did not depend on coastal peoples for any but the most exotic of goods (such as shell bangles).

The archaeological record at Kaundinyapura indicates that a variety of non-local goods such as sandstone and mica were utilized at the site. However, the habitation area of the site did not indicate what the ancient inhabitants were producing to finance their trade. The excavation reports contained mentions of shell-working debris and unfinished beads (Dikshit 1968), but the surface collection of the site did not reveal these materials in any quantity (either inside or outside of the collection units).[2] It may be that the site has been impacted by bead-collectors who have removed the majority of these surface materials. Residual evidence for bead-production is indicated by the recovery of small amounts of production debris (chipping waste, broken chert) in 51 of the collection units at Kaundinyapura. More substantial production activities, particularly those which required considerable space or produced noxious odours, may have been located away from the habitation portions of the site in the surrounding flatlands. Intensive field-walking around the site during the course of this project recovered no artefacts beyond the mounds and it appears that periodic flooding of the agricultural lands around the site has long since removed or obscured artefacts from any production-related subsidiary zones.

Important opportunities for surplus production were provided by the management of agricultural produce, domestic animals and forest products. Kaundinyapura is located in a rich zone of alluvial soil on the banks of the Wardha River, and the surrounding agricultural land would have been capable of producing an agricultural surplus beyond the needs of the site's inhabitants. The area around Kaundinyapura is now particularly noted for cotton production, which may have been a prominent cash crop in antiquity as well. It may have traded surplus produce to other agricultural regions, such as the areas which traditionally produced rice (such as the Chandrapur district, about 100 kilometres to the southeast; Grant 1984 [1870]). Inscriptions of the 4th century A.D. from the surrounding region indicate that the names of foods, such as plantains and rice, comprise parts of place names, so that certain places may have become known for particular foods, the surplus of which was traded away (Shastri 1992a). Although the transport system probably did not favour regular transfer of bulky foodstuffs, special-purpose foods and food during local famines might have been the subject of trade.

Surplus agricultural production as well as the availability of nearby grazing lands would also have enabled the production of domestic animals for household use or exchange, with the added benefit that animals are more easily transported to markets. Finally, numerous wild resources would have been available close to the site in antiquity. Early nineteenth century accounts indicate that forest cover along the Wardha River was substantially greater than at present. These forests are identified as containing a considerable number of useful products such as resins, gums and wood as well as animals valued for their skins; all of these natural products might have been exploited for the purposes of trade. Kaundinyapura's status as a regional centre, able to generate surplus income, is further seen through an examination of a contemporary settlement at Dhamantri, a site located 4 kilometres north and also along the Wardha River. This smaller site (0.75 ha) shows many similarities in locally-produced ceramics, but contains a much lower proportion of non-local goods such as micaceous ceramics and sandstone.

Regional and Local Exchange at the Site of Sisupalgarh

The information currently being generated through a systematic archaeological survey of the urban site of Sisupalgarh has also provided critical insights on the role of local exchange in the Early Historic period. Located in Orissa state, Sisupalgarh is a walled city of 130 hectares in size that presents evidence for large-scale labour investment in ramparts, columned buildings, and stone-lined tanks (Lal 1949; Smith 2001b). As at Kaundinyapura, these was relatively little occupation after the Early Historic period, so that again we can utilize the method of systematic surface collections to acquire data for the analysis of the inhabitants' economic life. Thus far, a total of 158 units have been collected ranging from 1 x 1.5 to 10 x 10 m (for a total of 6 760 m^2, principally concentrated on the interior of the rampart walls).

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[2] To be precise, these was one *T. pyrum* bangle fragment found in collection unit 204-37 and one undrilled carnelian bead near 204-37. The presence of these materials on the southwestern side of the site support the interpretation of this area of the site as an elite residential sector (Smith 2001: 96-101).

Ceramics comprise the majority of the artefacts recovered at the site, and while the analysis of the collected materials is not yet complete, visual assessment and sorting of nearly 70,000 sherds from the collection units indicates that there is little variability in the composition of the wares. The most significant distinction is in the quantity and fineness of sand in the paste, indicating that wares are likely to have been locally manufactured (given the alluvial surroundings of the site, perhaps within 3-5 kilometres; ongoing materials analysis is being undertaken in India to further evaluate the range of sources of ceramic production). Other artefacts recovered from the collection units also indicate a very local provenience of production and distribution. Bricks and tiles were likely to have been made from the same clay as locally-made ceramics. Laterite, carved into blocks and pillars, is available from a laterite plateau only one kilometre away. Sandstone, of various degrees of graininess and a variety of colours, is locally abundant and available from a distance of 6-10 kilometres.

Although our expectations are that cities pull in a vast economic hinterland that includes a significant amount of long-distance goods, examination of the collected materials to date at Sisupalgarh indicates otherwise. Clear evidence of regional and long-distance exchange at the site is limited, with four steatite fragments and one clearly non-local vessel fragment thus far constituting the most distinct 'imported' goods. The surprisingly low amount of evidence for even regional exchange at Sisupalgarh contrasts strongly with the data from Kaundinyapura that showed regionally-traded items forming a significant component of the domestic repertoire.

Many factors may have contributed to the distinctions that we see in the Kaundinyapura and Sisupalgarh data sets and to the counterintuitive suggestion that Early Historic towns may have been more reliant on regional exchange than cities were. Since both sites were studied from the collection of surface remains, they present comparable data sets; one potentially complicating factor at Sisupalgarh is that the uppermost remains at the site represent the latest occupations which may, at the end of the site's use-life, been relatively impoverished compared to earlier periods of occupation.[3] However, examination of the excavated materials from the entire stratigraphic sequence at Sisupalgarh indicates that pottery fabric is not highly variable over time, probably meaning that ceramics were primarily locally-made throughout the site's occupation.

The observations of the overwhelmingly local character of portable goods and architectural materials at Sisupalgarh indicates that we have probably underestimated the value of a locally-productive landscape in the success of cities. Such a perspective is suggested by H. Sarkar (1987: 635), who discusses the importance of agriculture as the basis for urban growth. Archaeological evidence of manufactured goods at sites such as Sisupalgarh indicates that the provision of much of the domestic non-comestible repertoire in cities was also locally-derived. Our expectations of significant long-distance exchange for cities may be skewed by observations of ports as a specialized city type which takes advantage of locations at zones of favourable transportation that are also located at ecotones (places of environmental change, such as desert/forest and land/sea). Non-port towns and cities may be radically different in their economic structure. Towns and cities grow from smaller origins not because of their long-distance contacts but because of robust local resources that can be used by a large segment of the population. Thus, even when long-distance goods are present in urban environments, we should consider them to be a *marker*, rather than a *cause*, of urban economic success.

Discussion and Conclusion

The observation that trade networks were primarily devoted to local needs has been an underlying theme in the analysis of Indian archaeological sites for many years, as the following example illustrates. In the excavations at Devnimori (located in the modern state of Gujarat), the artefacts recovered enable the identification of an Early Historic occupation: a stupa, Kshatrapa and Indo-Sassanian coins, Red Polished Ware, and a variety of beads (Mehta and Chowdhary 1966). Although the site is close to the areas of the western coast actively involved in trade in the Early Historic period, the only evidence for long-distance exchange at Devnimori consists of three amphora sherds. The authors commented that the use of predominantly local materials in the making of artefacts indicates that the 'settlement used the ideas current in Western India... (though) very few items came from far off countries' (Mehta and Chowdhary, 1966: 186). Although it was located in an area which gave it a geographical advantage in obtaining foreign trade goods, Devnimori's exchange networks did not make use of this potential. This apparent lack of importance of foreign trade in establishing or marking the site's prosperity indicates that the overall impact of long-distance exchange on the socio-political constructs of the subcontinent may be overestimated when exchange is investigated solely from the point of view of exotic commodities.

More recent scholars have also noted the strong regional continuities of material culture that were maintained over long periods of time in the Indian subcontinent. Lyonnet (1994: 263) has noted that the interactions of the Kushans in the northwest was marked by relatively few material additions on their part and that despite political changes 'the local culture(s) always proved to be very vibrant.' In a discussion of the effects and actions of the Satavahana polity, Sinopoli (2001: 173) has similarly observed that Satavahana political activities were conducted within a context of a 'pan-regional' material culture. Local trade is an integrative mechanism for population centers of any size; in the Early Historic period, this integrative mechanism, along with the religious institutions of Buddhism and Jainism, appears to have had a more significant continuity than any political entity. Ordinary goods, obtained through regular local and regional exchange, enabled individuals and households to signal their participation in a shared cultural system.

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[3] I would like to thank R.K. Mohanty for this observation, which serves to highlight the idea that surface archaeology presents broad-scale patterns. The surface of an archaeological site is a two-dimensional remnant of three-dimensional stratigraphy, and as such provides a much larger picture of the site than excavation, but at the cost of a collapsed time depth that almost inevitably over-represents the latest period of the site's occupation.

Archaeological evidence from the Indian subcontinent indicates that there were many, often overlapping, distributions of different types of goods. The trading networks in which Kaundinyapura and Sisupalgarh participated serve as examples of the many local and regional exchange networks which were present throughout the subcontinent in the Early Historic period. These functioned not only as trade routes moving local and long-distance goods, but were also social routes moving pilgrims and families, and political routes moving rulers and armies. An examination of the distribution of local and regional trade goods from individual trading sites, such as Kaundinyapura and Dhamantri, confirms that trade goods were a component of daily life and that individual households engaged in exchange. In cities such as Sisupalgarh, the size of the urban conglomeration itself (with a resultant specialized manufacture of items from abundant local materials) may have substituted for the wider regional reach that inhabitants of town-sized sites created for themselves.

The detailed examination of trade activities at Early Historic sites such as Kaundinyapura and Sisupalgarh provides evidence that exchange in the subcontinent was not limited to the elites and merchants of port cities. The energized and lively networks of exchange were supported by many different agents, in which the vast majority of exchange and transport activities moved goods made of local materials for local consumption. As nodes in long-distance networks, they were also used by pilgrims, conquerors, artisans, and traders of exotic goods as they moved across the larger distances that consisted of many local routes linked together.

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Early Historic South India and the International Maritime Trade

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Abstract

India's role in international commerce has not received the attention it deserves. South India has been slighted by many historians and archaeologists in favour of concentrating on events in the North. Beads are small items, often overlooked and not properly understood in their role in world trade. This paper seeks to help rectify the neglect of these topics. The period considered here are the first few centuries A.D.

The Characteristics of Trade

Trade is the engine of economic activity. The more complex and far-reaching the trade of a given polity is, the more sophisticated that polity will be in several fields. These include the mastering of communication and transportation skills, marketing acumen, the production of surpluses in order to have goods to attract buyers, and a stable and well-ordered society to facilitate commerce.

Trade activities may be characterized by using several criteria. One of these is the scope or extent of a trading system. Trade among early humans was localized or small-scale in reach in some parts of the world. The supplier of raw materials, the producer of a product, the merchant (often two or three of these tasks are conducted by the same person), and the customer live close to each other and commonly know one another. Ceramics frequently fall into this category.

Wider-reaching trade networks are more complex. Extractive and manufacturing processes tend to be more specialized and to have multiple centres. Layers of distributors and other intermediaries develop. On a regional basis, this is reflected by the ancient trade in lapis lazuli or of jade in either China or Mesoamerica. On a global scale, one thinks of coral, pearls, amber, and Indian agates.

It is no accident that my examples of the more complex networks centre on small, valuable objects often worn as beads. That is after all, my field. But there is another reason for this. Few materials have ever achieved the status of beads in regional or global trading networks. Small and valuable beads were always a significant component of wide spread trading networks.

A second distinction among trade networks can be made between land-based trade and maritime trade. While both had considerable reach, the sea routes inevitably encircle the land routes, especially as all of Africa and the Americas joined the world trade system. Maritime trade has advantages over land trade, including lower costs and greater flexibility in commercial relations. In the Asian context, the famed land-based 'Silk Road' completely bypassed India (as well as Southeast Asia) and thus was of only minor consequence in global trade.

A third discrimination between trading systems is based on the nature of the goods involved. A division is often made between 'utilitarian' and 'luxury' goods. However, most goods in anything other than localized trade were a luxury of some sort. Local substitutes could be found or the item simply dispensed with; none of these things were absolutely essential.

Textiles are often cited as the most common trade item, and an initial impression might be that they were utilitarian. Because of the abundance of textiles in the modern world, few recognize the immense value placed on them in the past. In Roman times, the average Mediterranean peasant never owned more than two or three new garments in their whole lives. Traded textiles were great luxuries.

Some items were more luxurious than others were, of course; a carnelian bead cannot keep you warm, neither can you eat it. Yet, even the most precious and least utilitarian objects play a crucial social role in the identification of the elite (Frank 1990: 182-183, 235). The use of diacritical markers such as status symbols by those who control commercial relations insures the future of more trade to import more such goods.

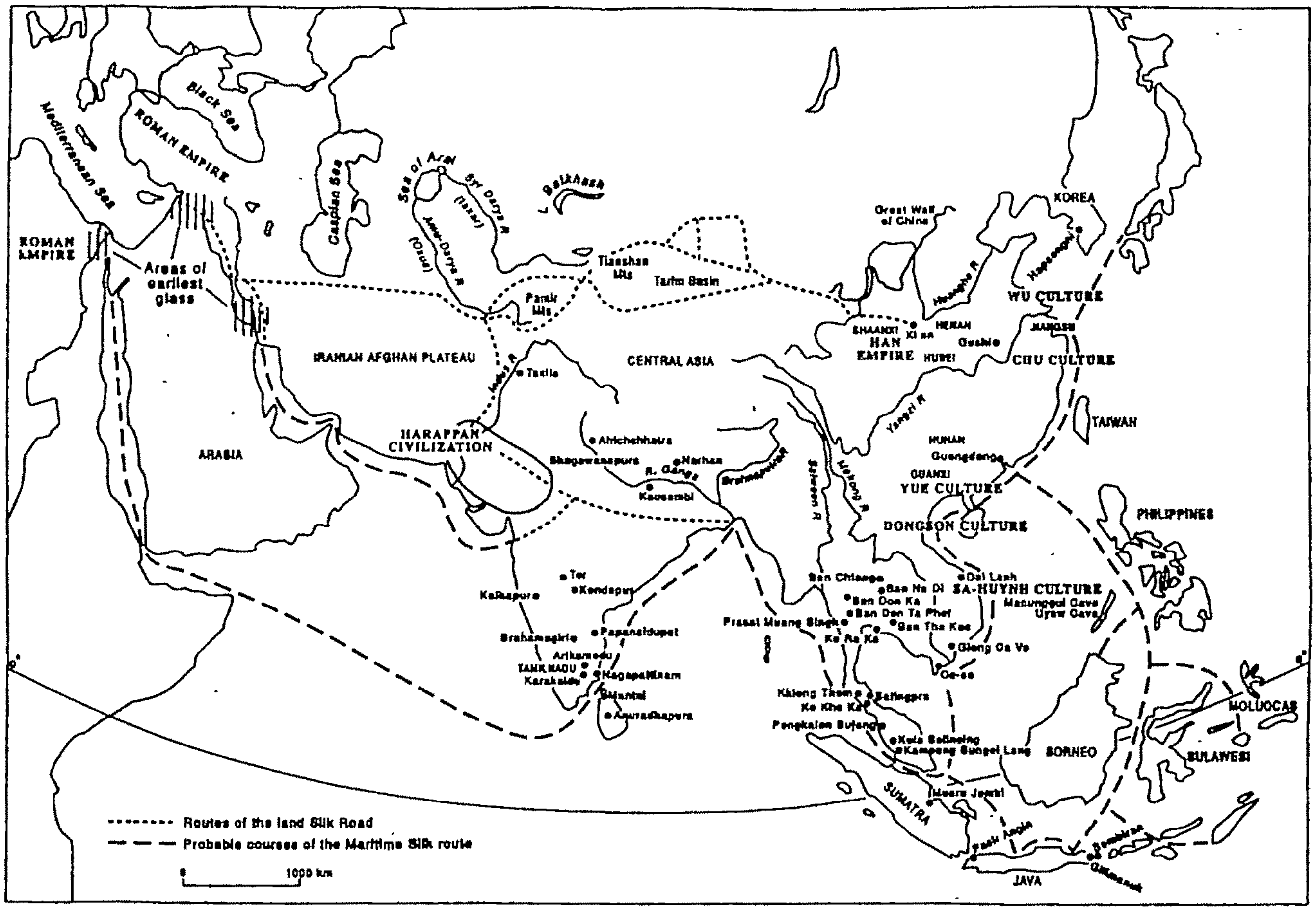

Fig. 1: Map of the Maritime Silk Route showing, inter alia, Indo-Pacific bead making sites in South-Southeast Asia and probable sea routes from the eastern Indian Ocean to Japan (after Glover and Anderson 1995)

Aside from distinctions between trading networks, we may categorize the constituent parts of a network according to their functions within it. One end of the network is a segment furnishing raw materials, often products of the jungle or mountains, places of low population density and historically without cities. These products were funnelled into progressively larger market centres until they reached the Big Place of the Big Man. If the products were very desirable and the Big Man clever, he may eventually take over adjoining territory and begin the process of State building. This is the 'upriver-downriver' model of Bronson (1977). It can be applied to many parts of Southeast Asia, as well as India.

The 'centre' of the network is where raw materials are processed into value-added products to be used in far-flung trade. The nexus between organized manufacturing and international commerce may seem a very modern idea, but no major trading network — not Rome's, not Song China's, and not, as we shall see, South India's — could possibly operate without it. Handled properly, a polity that could produce desired objects and successfully export them should be able to reinvest the wealth thus generated to produce more wealth.

The end of a trading network is the abode of the eventual consumers. They come in all shapes and sizes. The very wealthy will monopolize the most valuable items, but there are usually trinkets and gewgaws aplenty for even the common classes.

Connecting these three nodes is a complex web of people and organizations that make the very concept of trade possible. They are the mariners and the merchants; the financiers and local distributors. They include lofty potentates, poor, itinerant village peddlers, and corner shopkeepers.

In sum, trade can range from the very simple to the enormously complex. On one hand it may involve a man who scoops up clay from the river, fashions it into a pot, and gives it to his neighbour in exchange for some mangoes. On the other, the advent of the Internet allows us to buy and sell goods instantly across national and natural barriers in the comfort of our own homes. Ancient maritime trade was neither as simple as the first example, nor as complex as the second, but somewhere in-between.

Rome and India

The archaeological and literary evidence for commercial connections between the Roman world and India are well known and have been considered and reconsidered for many years (*e.g.* Warmington 1928; Begley and De Puma 1991). For a long time, the emphasis was on the roles played by ports in western and especially northwestern India.

The fact is, the Romans themselves knew or thought they knew a great deal more about northern India than they did about the southern region. In the first century Pliny the Elder said that 'the rivers that produce gems are the Chenab and the Ganges, and of all the lands that produce them India is the most prolific' (Eichholtz 1962: 327-329). He was wrong. Neither of these rivers are major gem producers, a role played by the Narmada and several southern rivers. The anonymous first century author of the *Periplus Maris Erythraei* (*Periplus of the Erythraean Sea*; hereafter simply the *Periplus*) (Casson 1989) and Ptolemy, the author of *Geographia* in the second century (Stevenson 1991), had fair, if not entirely accurate, understandings of the source and workings of gemstones in Western India (Francis 2002: 104-105). However, when it came to the gem industry of South India, only the port of Muziris was known and nothing was understood about how the industry operated (Francis 2002: 119-121), an ignorance echoed by many later writers.

Yet, the commerce in gemstones, so important in Indo-Roman trade, was almost all in the hands of South Indians. Pliny discussed India's role as supplier of important gems on several occasions:

1. Beryl. 'Beryls are produced in India and are rarely found elsewhere' (Eichholz 1962: 225).
2. Rock Crystal. 'That of India is preferred to any other' (Eichholz 1962: 181).
3. Amethyst. 'Here the first rank is held by the amethysts of India' (Eichholz 1962: 263).
4. Almandine Garnets. 'The best [garnets] are the 'amethyst-coloured stones'... Many writers state that the Indian stone is brighter than the Carthaginian' (Eichholz 1962: 239-41).
5. Prase. 'There are also many other kinds of green stones. A member of the commoner class is the prase... India produces... these stones...' (Eichholz 1962: 255-7).
6. Onyx. 'Formerly, as is clear from the very name, sardonyx meant a stone with a layer of carnelian resting on a layer of white... Those stones that have now usurped the name although they lack all trace of the carnelian of the Indian stones come from Arabia...' (Eichholz 1962: 233). Pliny was not entirely correct here. He was observing the change in taste favouring South Indian (not Arabian) black onyx over the previously popular West Indian red and white sardonyx.
7. Pearls. 'Next [second only to diamond] in value in our estimation come the pearls of India and Arabia' (Eichholz 1962: 213). Of all these gems, only pearls had a rival source to India in the Persian Gulf.

Pliny also listed India along with several other sources for diamonds (Eichholz 1962: 207). In truth, India was the principal diamond source for millennia. As Bauer (1968: 140) put it, 'Diamonds have been known in this country [India] longer than in any other, and the most beautiful, famous and many of the largest stones were found here.'

The origins of all these stones are chiefly in South India. There are other sources for some of them, but the major one are in the peninsula. Pearls came from the Gulf of Mannar. Beryl, rock crystal, and no doubt amethyst, were found around Kodumanal in Periyar district, Tamil Nadu. Diamonds and almadine garnets are found in the Krishna-Godavari doab. Arikamedu is the first place known to have made black onyx (which is rendered such by treating agate). The source of prase has not been identified, but it was an important beadmaking material at Arikamedu.

In the fourth century A.D. Dionysius Periegetes wrote of many of the same gemstones in his poem *Description of the Whole World*:

> '[The Indians] are variously occupied; some by mining seek for the matrix of gold, digging the soil with well-carved pick-axes, others ply the loom to weave tex[tiles] of linen, others saw the tusks of elephants and varnish them to the brightness of silver, and others along the course of mountain torrents search for precious stones, the green beryl, or the sparkling diamond, or the pale green translucent jasper, or the yellow stone, or the pure topaz, or the sweet amethyst, which with a milder glow imitates the lure of purple.' (Prasad 1977: 199; van de Woestijne 1953: 95; insertions mine)

Again, these are southern stones. The 'pale green translucent jasper' may be the crystalline prase worked at Arikamedu. The 'yellow stone' is citrine (golden quartz), which is humanly altered from poor quality amethyst and appears in the record first at Arikamedu. What Dionysius meant by the 'pure topaz' will probably never be known.

His reference to purple is to the 'royal purple' dye obtained from certain shellfish along the Mediterranean coast. Of course, the Indians were more likely to have been weaving cotton rather than linen.

While Ptolemy correctly located the 'Sardonyx Mountain' along the Narmada (though too far inland) and the author of the *Periplus* knew that agates were cut in Ujjain and shipped out through Bharuch, no under-standing existed for the far more important gem industry of the South. Ptolemy does not even mention the pearl fisheries of the Gulf of Mannar. He places 'Puttana in which is beryl' loosely somewhere in southern India. The first century port of Muziris is said to be on the Pseudostomus River, a term that means 'false inlet.' While the Roman traders bought the gems at Muziris and knew that they came down or along the river, they were never able to enter it because whatever river it was ascended the Western Ghats (see Francis 2002: plates 37-40). The Romans knew nothing of the Palghat Gap.

South India: Nodes in the Trading Network

As we discussed, one way of examining a trading network is to consider its constituent parts. What were the nodes in the South Indian gem industry? The sources of raw materials have been mentioned above. The most straightforward one is the fishing for and the piercing of pearls, done at Korkai. Kodumanal and the well-known settlement of Arikamedu have already been mentioned in this respect, and they were the principal beadmaking sites.

I shall not belabour the importance of Arikamedu as a beadmaker in both stone and glass (which will be discussed later). I have written extensively on this topic (*e.g.* Francis 1987, 1990, 1991, 2002). Kodumanal is not so well known, but the excavations by Rajan (1990) there revealed it to be a bead maker of note. It probably also supplied Arikamedu with rock crystal (and likely amethyst). It is mentioned in the *Sangam* poem *Patirruppattu* (the *Ten Tens*) as a village of goldsmiths (Champakalakshmi 1990: 13; Rajan 1990: 93, n. 1). Moreover, it is very close to the Palghat Gap.

The other source of raw materials mentioned above is the Krishna-Godavari doab. Almadine garnets are found near Kondapalli, Guntur district, Andhra Pradesh. Diamond mines are concentrated in the Golconda (Ellore) region. The beds of the two rivers also yield carnelian, agates, and possibly even prase (Francis 2002: 116-118). Ingredients for the glassmakers of Arikamedu also came from the doab. This region was under-populated and underdeveloped at this time and within the area Leshnik (1974: 19-20) called the 'Tribal Belt.'

The raw materials were moved to the two sites of Kodumanal and Arikamedu and fashioned into beads. They, along with pearls added at some point, were shipped out to the western world through Muziris, at least for some time. Exactly how they got to Muziris is not entirely understood. The products of Kodumanal present no problem, but whether those of Arikamedu and Korkai (pearls) went via land roads like those maintained later by the Imperial Cholas (Nilakanta Sastri 1975: 594-595), around the peninsula via the sea, or through a system set up by the relatives of the beadmakers is not fully understood (Francis 2002: 121-122).

The port of Muziris was well known to the Romans and noted by the author of the *Periplus*, Ptolemy, and even the later copy of an earlier map known as the Peutinger Table (Stuart 1991). *Sangam* poems also discuss Muziris. The *Purananuru* (*The Four Hundred Stanzas of War*) described it in some detail:

> 'With its streets, its houses, its covered [fishing] boats, where they sell fish, where they pile up rice — with the shifting and mingling [crowd] of a boisterous river-bank where the sacks of pepper are heaped up — with its gold deliveries, carried by the ocean-going ships and brought to the river bank by local boats, the city of the gold-collared Chera king, [the city] that bestows [wealth] to its visitors indiscriminately, and the merchants of the mountains, and the merchants of the sea, the city where liquor abounds, yes, this Muziris, where the rumbling ocean roars, is given to me like a marvel, a treasure.' (Méile 1940: 93; my translation from the French)

The *Agananuru* placed Muziris on the Periyar River (Méile 1940: 90). Casson translated the passage in this way:

> 'The city where the beautiful vessels, the masterpieces of the Yavanas [Westerners], stir white foam on the Periyar, river of Kerala, arriving with gold and departing with pepper — when that Muçiri, brimming with prosperity, was besieged by the din of war.' (Casson 1989: 296)

Yet, Muziris has never been found, despite considerable searching. The hint that it was on the Periyar River does not help, as the name simply means 'the big river', and what was the Periyar of ancient times may well not be the Periyar of today, given the shifting nature of both rivers and shores along the Malabar coast. There are several Periyar Rivers mentioned in the *Sangam* poems. The other 'hint' cited by some authors is the appearance of a 'Temple of Augustus' (*Templ. Augusti*) near Muziris on the Puetinger Table. It would, indeed, be interesting to discover such a building. However, I have serious doubts that it was ever there. It seems more likely to me that it was a temple dedicated to the popular Agastya, sometimes called the 'patron saint of southern India,' and misinterpreted by some Roman visitor.

In fact, Muziris disappears rather quickly. All the Roman and *Sangam* references to it are early, not dating later than the second century A.D. (Francis 2002: 120). The *Sangam* literature does not mention the *Yavanas* (Westerners) after the first century or so (Zvelebil 1973: 35). Archaeologically, the most important Roman port for trade with India was Berenike, Egypt. The beads suggest that up until the third century Berenike was trading with Muziris. During the third century, there was virtually no trade between the two partners. When trade resumed in the fourth century, the beads indicate that they were coming from Mantai, Sri Lanka, and not from India (Francis 2001a). It is also during the fourth century that small denomination Roman coins are suddenly found in great numbers in Sri Lanka (Weerakkody 1997: 163-164).

On the East Coast, the principal port for international trade was also the major beadmaking site: Arikamedu. Arikamedu was a leading beadmaker of both stone and glass beads for a period of some two thousand years. No other place has ever come close to the prominence of Arikamedu in this regard. Its glass beads, especially, have been traced as far east as Bali and probably also to Japan and western Africa (Francis 2002: 44-46, 50) in the first few centuries A.D. The attributes of the Arikamedu glass bead industry parallel those of the stone bead industry. The raw materials were apparently concentrated in the Krishna-Godavai doab, taken to Arikamedu for processing and then sent out by sea to the east and via Muziris to the west.

Arikamedu played an even larger role in the history of beads than as an exporter. It was apparently the cradle of a particular glass beadmaking technique in which a glass tube is produced continuously from a furnace for several hours and is later cut into segments which are heated to round them into small beads. Not only are the beads widespread, but the unique beadmaking method has been identified at no less than ten sites in what are now six modern countries — India, Sri Lanka, Vietnam, Thailand, Malaysia, and Indonesia — particularly in the early Southeast Asia states of Funan and Srivijaya (Francis 2002: 27-41). The evidence also suggests that to some extent Arikamedu's stone beadmakers migrated to some of these sites (Francis 2002: 141-143).

South India: the People

The question remains: who were the actors in this complex trade in South Indian gems. The southern part of the Indian peninsula is a region traditionally occupied by the three Tamil Kingdoms: the Cola, the Cera, and the Pandya. All trace their ancestry to the three Pandya brothers, who made their fortune on the pearl fisheries of Korkai, in the far south (Maloney 1969: 13).

There was also a group of people whose precise identity has not been determined. Their very existence was once thought of as the 'Megalithic Problem.' I must agree with Leshnik (1974: 1-2) when he argues that this term is completely inappropriate and he has 'rescued from oblivion [the] useful term' *Pandukal*. Indeed, just the exercise of substituting 'Pandukal' for 'Megalithic' allows the mind to free itself from prejudges that had been built up for more than a century. The Pandukal people were not some mysterious race who occasionally buried their dead in small monuments on isolated hilltops. Yes, they did that, but they were much more.

Even when Leshnik (1974) finished his exhaustive compendium, no Pandukal habitation sites were known. In the quarter century since, discoveries in Vidharbha in Maharashtra (Deo 1973, 1983; Mohanty and Walimbe 1996), Kongu in Tamil Nadu (Rajan 1990), western Tamil Nadu (Rajan 1998), Karnataka (Sundara 2000/2001), and south India as a whole (Moorti 1994) have filled this gap. Accelerated programs for identifying Pandukal associations have revolutionized the thinking of the relationship of these people to the Tamil Kingdoms. At first, it was easy to think that any relationship would be minimal, accidental, perhaps even hostile or aggressive.

However, the picture looks much different now. Pandukal associations are not only widespread in Tamil territories, but they are also quite early. Far from a slow 'migration' from the northern part of the peninsula, let alone somewhere beyond, radiocarbon dates for southern Pandukal sites are now as old as those for sites in Vidharbha or elsewhere to the north. Korkai, the very birthplace of the Tamil Kingdoms, was originally settled as a Pandukal town with a radiocarbon date of 905-780 B.C. after calibration (Moorti 1994: 4-5). Arikamedu, the most famous archaeological site in the South, was not fashioned by the minds of Romans, but was always at heart a Pandukal city, evidenced from its very beginning. The late and sadly missed Vimala Begley pointed out to me that the earliest ceramic assemblages we reached were of far greater variety that would be expected of a simple (Pandukal) fishing village. The earliest date secured at Kodumanal is around 250 B.C. (Rajan 1990: 93).

Who were these Pandukal people? Were they just Tamils in another guise? How did these two groups interact? Since Pandukal people brought horses, iron working, and gold smithy to the peninsula, they must have played a role, perhaps even a major one, in the development of the Tamil Kingdoms. Were they apart from Tamil society, leaders in Tamil society, or people who later were acculturated into it? Certainly, some forms of cooperation would have been advantageous to both groups. This is not the place to attempt to answer these questions, but a reconstruction of the South Indian maritime trade may furnish us some clues.

The *Sangam* poems mention the gathering of precious stones by the *kovallr* (cattle-rearing people) and the *kamavas* (hillock people), who sold them in the markets

(Rajan 1997/1998: 59-60). Both names suggest Pandukal people, who were herdsmen and often dwelt in hilly regions. However, the precious stones found adventitiously after a rain or a herd of deer had passed over some spot, as the poems describe, would not have been sufficient to furnish the lapidaries at Arikamedu and Kodumanal with their needed raw materials.

The Pandukal people are known to have settled in places where gold and/or iron was available. Certainly, their choice of Kodumanal may also have been influenced by the proximity to quartz, beryl, and sapphire deposits, as perhaps was Korkai with its wealth of pearls. The young men of the community evidentially rode horses in their function of keeping cattle. They would have been in an excellent position to scout out natural resources. It seems likely that it was they who periodically visited the Krishna-Godavari doab and acquired raw materials for the beadmakers. They would hardly have gathered the materials themselves, but would have obtained them from the local tribal people who likely did the hard, dirty work of actually digging the stones, as has been done for millennia along the Narmada. Quartz, beryl, and gold were furnished from Kodumanal, while carnelian, agate, almandine garnets, probably prase, and diamonds (from drilling) would have come from the doab. Additionally, both copper and wad (bog manganese, an impure manganese ore) used for coloring the glass beads at Arikamedu are available in the doab.

While the ethnic connections of the glass beadmakers at Arikamedu are not easy to discern at this point, the stone beadmakers have left a clue as to their origin. All the stone beads at the Pandukal sites of Mahurjhari in Vidarbha and Kodumanal in Kongu as well as about half of those at Arikamedu were worked in a distinctive manner. That is, after the raw stone was chipped into a roughout it was pecked into a bead blank, then polished, and drilled. This is quite different from that the beadmaking sequence used in Harappa, Deccan Chalcolithic sites, or at modern Cambay (Khambhat) where the chipped rough out is ground rather than pecked and drilled before being polished. The 'pecking complex' appears to be distinctly Pandukal and the beadmakers of Kodumanal and about half of those of Arikamedu seem to belong to this group. The last remnants of stone beadmaking in South India, at Kangayam (Erode district, Tamil Nadu) follow the 'pecking complex' of stone beadmaking (Rajan 1997/1998).

Finally, the gems had to be exported. Those of Arikamedu that went east would have used the port facilities of that city. Those of Kodumanal going west would have gone through the Palghat Gap to Muziris (there is no indication of eastward trading of Kodumanal gems; no beryl has been found at Arikamedu). The westward-bound gems of Arikamedu and the pearls of Korkai must have travelled by one or more other means.

If the trade were in Tamil hands, one would expect these gems to travel on roads, through Uraiyur (from Arikamedu) and Madurai (from Korkai) to Karur and then along the Kaveri and the Noyil to Kodumanal and on to Muziris. In this case, the gems would have passed through all three Tamil capitals and probably be subject to heavy taxation.

Arikamedu gems might also have been shipped south by sea, being transferred at Alagankulam (Tamil Nadu) or Uratota (Jaffna peninsula) to small vessels that could navigate the restrictive 'Adam's Bridge' at the Palk Strait. They would have been regrouped at Mantai (Sri Lanka), where pearls could have been added, and sent north to Muziris.

A third route may have been controlled entirely by the Pandukal people. A thick belt of Pandukal settlements, many of them large, extends from the mouth of the Kaveri to the Palghat gap (Moorti 1994: 17). Given that the Pandukal people were equestrians, transportation of small, highly valued goods through this network may have been quite swift.

Whichever scenario one favours, all required cooperation between Pandukal and Tamil people (if they were separate people) and all three Tamil Kingdoms. Except for the *Periplus* describing maritime trade along the southern Indian coasts, there is no hint in Western literature about the mechanics of this trade that was so important to the Roman-Indian commerce. All of Ptolemy's rivers in south India flow away from each other; the Peutinger Table is even less detailed.

Conclusions

The central role of South India in the international gem trade has caused me to call the region the 'Treasure Chest of the Ancient World' (Francis 2002: 118). Far from being women's trifles or minor objects, beads, whether of semiprecious stone or glass, have long played crucial roles in human behaviour. Indeed, the recent discovery of what are recognized as the earliest beads in the world has prompted discussion of their role in the development of culturally modern humans (Ambrose 1998; Khun *et al.* 2001). They are no longer viewed as mere toys but as important markers of human status and as symbols of the emergence of modern humans.

Nor have they become less relevant over time. An Indian need only think about a *manglesutra* or a *tali, rudraksha* or *tulsi, kathla* or charm case, or plastic, glass, silver, and gold to recognize some of the roles beads play in modern society. As small, valuable, and highly portable objects they were natural items for commerce and the trade in beads and bead materials is tens of millennia old.

The picture drawn here of South India and its role in the making of valuable trade items and in international commerce is at variance with the usual view of this region, particularly of the Pandukal people. It is, however, consistent with both the archaeological record and the representation of South Indian society as recorded in the *Sangam* poems.

What is perhaps most striking is the apparent role played by the Pandukal people in this trade. The appreciation of these people has grown significantly over the last few years. An excellent example of this is the understanding of their position at Arikamedu. Wheeler (Wheeler *et al.* 1946; Wheeler 1954) had no appreciation of their function at the site. Casal (1949) at least recognized their existence, but his observations were devoted to the 'megalithic' ceramic component. Gupta (1995/1996) stressed their role in the development of Early Historic South India, while I (Francis 1993; 2001b; 2002: 112-125) have also held this position, particularly in the realm of economic development.

People who could produce small, valuable, highly desired objects have always been in a position to profit handsomely from trade. South India was the leader in the production of beads of both stone and glass for centuries. The Pandukal people seem to have been in the forefront of this industry. A new appreciation of beads, their role in international trade, and the role of South India in that trade are long overdue.

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Comparison of Prehistoric Glass Beads from Korea and Thailand

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Abstract

This paper presents new evidence of contact between the eastern Indian Ocean region and Iron Age Korea through microprobe analyses of trade beads.

Introduction

Elemental compositional analyses using energy dispersive X-ray spectrometry (EDS) were done on seven Korean glass beads, a yellow opaque bead dated 1st century A.D., and six other beads dated 3rd-4th century A.D. Five glass beads from Thailand, dated 1st century B.C.-2nd century A.D. were also analysed and compared to the Korean glass. The analyses for the sets of beads and two Korean furnace fragments of glass are listed separately on the following pages, with brief comments on the results.

Non-destructive surface analyses only were done for all of these objects. Due to the problem with surface analysis of vitreous materials, this type of analysis can only give approximate, semi-quantitative compositions of the material. Possible alteration of the surface due to weathering and surface deposits can also alter the apparent results, although the analyses were done on areas of apparently relatively fresh breaks, when possible, to avoid the weathered surfaces. The numbers reported are normal EDS standardless calculated oxide results, in relative weight percentages of elements detected. This model EDS does not detect elements below the atomic weight of sodium, such as oxygen and fluorine.

The two furnace fragments were also sampled and embedded for later quantitative analysis of the materials.

Description

Korean opaque yellow glass bead, dated 1st century A.D., and six glass beads dated *c.* 3rd-4th century A.D.

Comments

The opaque yellow cylindrical bead was found to have a soda glass composition with low levels of magnesium and calcium, a very high level of aluminium, and a small amount of lead. Crystals composed of lead and tin in approximately a one to one ratio were seen in the glass matrix. These appear to be the yellow colorant and opacifier lead-tin yellow ($Pb_2Sn_2O_7$).

Five of the other six glass beads were also found to have soda glass compositions, with low magnesium and calcium, and high aluminium, in one case (no. 3) very high. A trace of lead was seen in beads 2 and 3, but not in the others. Copper, in the form of cuprite, appears to be the colorant in bead number 2, and copper oxide is the colorant in bead number 3. Cobalt was detected in the blue bead number 4, but not in numbers 5 and 6. Cobalt may also be the colorant in these two beads, but is present below the minimum detection limits under these conditions, approximately 0.1%.

Bead number 7 was found to be a potassium-based glass, with very low levels of magnesium and calcium, and high level of aluminium. No lead was detected. Cobalt may also be present as the colorant, but was not detected in this analysis.

These analyses in general are in agreement with the previous EDS analyses done at another laboratory. The only major difference seen was in the much lower levels of manganese and iron reported here for bead number 7, about half that in the previous analysis.

Description

Five glass beads from Thailand, dated 1st century B.C.-2nd century A.D.

Comments

All the five glass beads were found to have soda glass compositions. The opaque red bead and the green bead were found to be somewhat similar to the Korean beads examined in having rather low magnesium levels, with very high aluminium levels, and traces of lead.

Table 1: Korean Beads (weight per cent)

	3rd-4th c. A.D.						1st c. A.D.
Bead No.	2	3	4	5	6	7	
Colour	Opeque red	Turquoise	Blue	Blue	Blue	Blue	Yellow
Na_2O	19.1	20.1	18.8	18.5	20.9	2.2	8.0
MgO	1.2	0.7	0.5	0.4	0.5	0.4	0.6
Al_2O_3	6.0	16.9	6.6	6.5	4.7	5.6	11.6
SiO_2	60.1	51.1	64.6	65.1	63.8	71.1	60.5
P_2O_5	–	–	–	–	–	–	–
SO3	0.2	0.2	0.2	0.2	0.4	–	0.7
Cl	1.1	1.8	1.5	1.7	1.6	0.3	1.2
K_2O	2.5	2.9	1.6	0.9	2.2	15.9	3.8
CaO	2.5	2.3	2.1	2.8	2.3	0.9	1.8
TiO_2	0.9	0.7	0.4	0.1	0.2	–	1.3
MnO	0.1	–	1.4	1.4	1.6	1.7	–
Fe_2O_3	1.9	1.5	2.0	2.1	1.1	1.5	2.2
CoO	–	–	0.1	–	–	–	–
CuO	3.6	1.2	0.1	0.1	0.1	0.1	–
SnO_2	–	–	–	–	–	–	0.7
BaO	–	–	–	0.3	0.2	0.2	–
PbO	0.7	0.5	–	–	–	–	7.5

Table 2: Korean and Thailand Beads (weight per cent)

Bead No.	Korean ca 7th c. A.D. furnace fragments		Thailand ca. 1st c. B.C.-2nd c. A.D. Glass beads				
Colour	Green	Amber	Opaque red	Orange	Yellow	Blue	Green
Na_2O	1.5	–	18.2	18.8	17.0	18.2	18.1
MgO	2.4	–	1.1	5.1	6.9	7.9	1.6
Al_2O_3	10.8	0.4	10.1	8.7	2.6	1.6	15.5
SiO_2	55.1	43.2	57.9	45.2	53.4	58.6	48.7
P_2O_5	1.4	–	–	1.9	–	–	–
SO3	0.7	–	–	–	–	0.5	0.4
Cl	0.1	–	1.0	1.1	0.5	0.8	2.0
K_2O	5.8	–	3.0	4.3	3.5	3.3	3.7
CaO	19.4	0.2	2.3	4.3	4.2	6.0	3.2
TiO_2	0.6	–	0.8	0.4	0.4	0.1	0.8
MnO	0.3	–	0.2	–	0.8	1.3	0.1
Fe_2O_3	1.8	0.6	1.9	1.6	0.4	1.2	2.1
CoO	–	–	–	–	–	0.2	–
CuO	0.1	0.6	1.8	5.6	–	0.2	2.8
SnO_2	–	–	0.5	0.5	1.1	–	–
BaO	–	–	–	–	–	–	0.2
PbO	0.7	54.5	1.0	2.4	8.4	–	0.8

The orange, yellow, and blue beads, however, were found to have very high levels of magnesium. While the orange bead had a high aluminium level similar to the Korean beads, the yellow and the blue beads had much lower aluminium levels. The calcium levels in these three beads, especially in the blue bead, were also somewhat higher than that seen in the Korean beads.

Copper, in the form of cuprite, appears to be the colorant in the red bead, as well as in the orange bead, and copper oxide is the colorant for the green bead. Lead-tin yellow crystals were observed in the yellow bead, and may also be present in the opaque orange bead. Cobalt was detected in the blue bead.

Description

Korean glass furnace fragments with adhering glass, dated *c.* 7th *c.* A.D.

Comments

The green glass fragment unfortunately appears to be very weathered, making conclusions about the original composition difficult. This glass was found to contain a rather low level of magnesium, and very high aluminium. Only a very small amount of sodium was found, with a larger but still rather low level of potassium, making it hard to conclude if this is a sodium or potassium-based glass. A very high level of calcium was also seen, as well as a trace of lead. The greenish colour appears to be due to the iron present.

The amber glass was found to be a lead-silica glass, with a very high lead content. The absence of detectable levels of sodium, magnesium, and potassium may be due to weathering of the glass.

Samples of both glasses were taken for preparation for better quantitative analyses. However, the extent of weathering may preclude good analysis.

Concluding Remarks

According to the result of the beads analysed, mentioned above, we would like to summarize and point out the following three points in respect of the comparison of Korean and Thailand glass beads of the Prehistoric Age.

(1) Yellow opaque glass bead of Korea (which were excavated from Misari site near Seoul, dated 1st century A.D.) is very similar to the yellow bead from Thailand, especially with the aspect of 'Lead-tin' yellow mentioned in the previous comments.

(2) No. 2 to No. 7: Glass beads from Korea (ca. 3rd-4th century A.D.) are divided into 2 groups; soda glass and potassium glass.

These results all match with my prior works (In-Sook Lee 1994). Some soda glass beads can be compared with soda glass beads from Thailand, especially in high Al_2O_3 composition.

- Potassium glass (No. 1: K_2O 15.9 %) also coincides with the other result of Southeast Asian glass beads analysed before by Kishore Basa.

(3) Among glass furnace fragments from Korea, amber (brownish) colour glass has high lead composition (54.5%: PbO). This kind is typical and popular glass of that age (7th-8th century A.D.) in Korea. And the fact of the glass manufacturing can be clearly proved (In-Sook Lee 1995).

Acknowledgement

Sample beads from Thailand come from Khlong Thom District, Khuan Luk Pot, Krabi Province, Southern Thailand. Mrs. Amarna Srisuchat provided these samples.

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West Asian Sassanian-Islamic Ceramics in the Indian Ocean, South, Southeast and East Asia*

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Abstract

Turquoise-blue glazed storage jars of the late Sassanian–early Islamic Period (seventh–early eleventh century A.D., comprise a distinctive ceramic type exported from Lower Mesopotamia and found widely distributed around the shores of the Indian Ocean, into Southeast and East Asia, coastal China, even reaching southern Japan (Fig. 1). Because they are easily recognizable and were exported over a rather short time span, they provide a useful tool for cross-dating sites in which they have been found and also give a useful perspective into the dynamics of early Islamic trade to southern and Eastern Asia (see also Tamboe 1989: 31).

Introduction

The trade in Chinese ceramics of the Tang period to Southeast, South and Western Asia has been rather well studied with many detailed reports and some general summaries, notably and most recently by Rougeulle (1996)[1]. However the complementary and roughly contemporary movement of Western Asian glazed ceramics from Mesopotamia, Iran and Egypt to India, Sri Lanka, Southeast Asia, China and Japan is less known although some significant papers have been written by Carswell (1977), Carswell and Prickett (1984), Feng (1986) and most recently by Mikami (1984, 1985) Aoyagi (1991) and Ho (1993, 1994 and 1995).

My interest in this topic is quite recent and derives directly out of our excavations between 1993 and 2000 at ancient Simhapura, the medieval Cham city at Tra Kieu in Central Vietnam (Nguyen Chieu *et al.* 1991; Glover and Yamagata 1995; Glover *et al.* 1996, 1998; Yamagata 1998) where we have excavated a rich sequence of pottery and building debris from a number of excavations dated from the late centuries B.C. up the sixth or 7th centuries A.D. Finds from the eighth–eleventh centuries when the fortunes of the ancient Cham kingdom of Amaravati was at its zenith have so far proved to be rare in the various excavations that we and our Vietnamese colleagues have made around Tra Kieu. However, from about 12th to 19th century we find later Cham and Vietnamese earthen wares and imported, mainly Chinese, glazed ceramics in the top

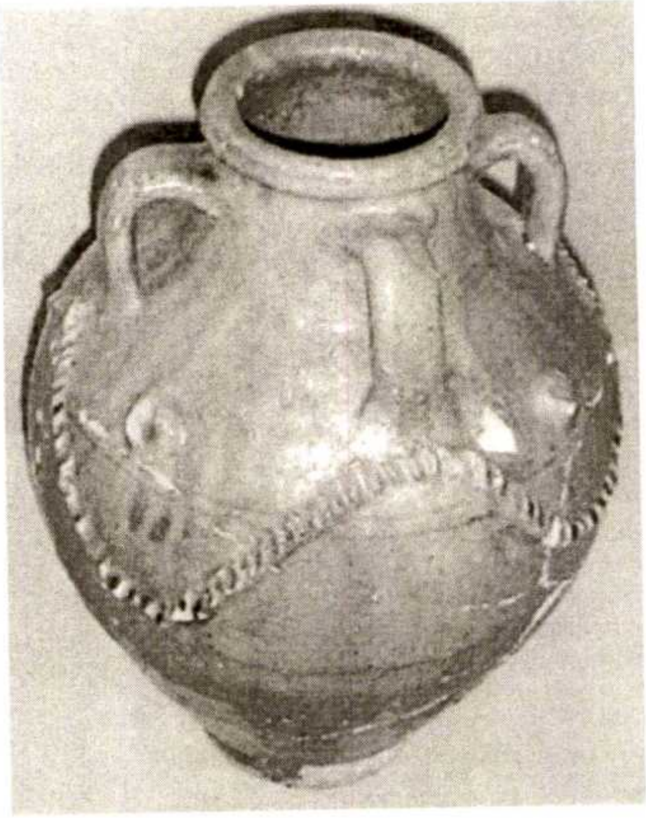

Fig. 1: Typical turquoise glazed earthenware jar with handles, Iraq, 8th, 9th century. (British Museum 1912-5-201), (photo I. Glover, (B & W print from digital image)

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* This article was first presented at the conference 'Seafaring Communities in the Indian Ocean (4th century B.C. to A.D. 1500' at the Maison de l'Orient, Lyon in July 1996, and has subsequently been revised although many new finds made since then may have been overlooked by the author.

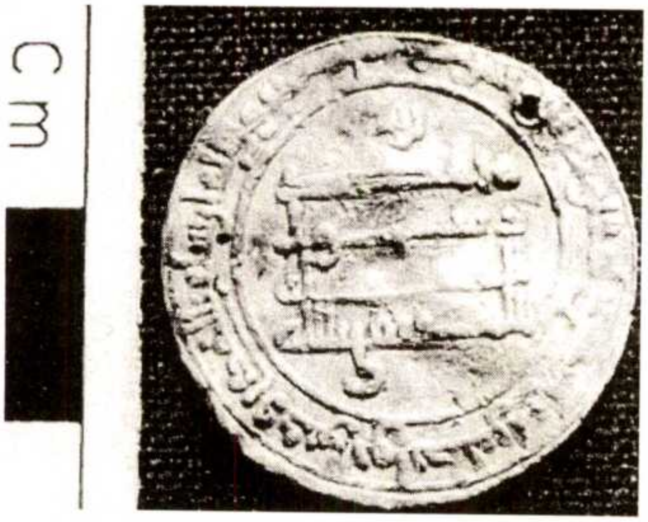

Fig. 2: Tenth century Abbasid gold *dinar*, from Chiem Son Tay, Thu Bon Valley Central Viet Nam, (photo by I. Glover), (colour slide)

two layers which have been very much disturbed by ancient disturbances and recent looting.

In March 1995 while surveying at a site called Trien Trang (White Flower Mound) near Chiem Son Tay, about mid way between Tra Kieu and Mi Son, we found some turquoise blue glazed ceramics with a soft pale cream body identified as Islamic wares of the 8th-10th centuries. Some Abbasid gold coins had been found at the same location a few years ago, one of which we were able to photograph in the collection of Father Antoine Nguyen Thanh in Danang[2] (Fig. 2).

During another survey at Tra Kieu in the Spring of 1996 two more sherds of the turquoise-glazed ware were found on the surface (Yamagata 1998) and a single piece was recovered in a stratified context at the location called Hoan Chau near the main temple mound (Point A of Claeys in 1927-28) during excavation there in 2000. However, a recent excavation at Bai Lang on Culao Cham (Cham Island) (see below) is starting to provide important information on the external trade links of Champa — which we know to have been extensive, but on which, until now, there is little precise data for this period.

West Asian Sassanian-Islamic Ceramics

Between the seventh–tenth centuries A.D. quite a large range of glazed ceramics were traded south and east from Mesopotamia, southern Iran and Egypt. Ho (1994) for instance, mentions six different groups including Turquoise Glazed Ware (henceforward TGW), Tin-white Ware (TWW), Yellow-enamelled White ware, Blue-on-White ware and Impressed-relief Green ware with forms comprising mainly bowls and jars. In this paper, however, I will focus on her first group (TGW) which come as large jars variously called Mesopotamian, Abbasid, Samarra, Basra, turquoise-, or blue-glazed vessels by different authors[3]. These vessels have a soft, yellow-buff fabric often with fine sand inclusions with a thick turquoise alkaline-glaze which is usually ill-fitting, crackled and flaked and applied over low relief ornament. The jars usually have straight, more or less vertical necks, swelling bodies and flat bases, with ornamental lug handles. Mason (1991a, b) refers to them as *Hib* from a local Arabic term.

The Sassanian-Islamic label is preferred since there is a continuing tradition of making and exporting blue-glazed wares from the Parthian and Sassanian periods until the expansion of Islam and it is not always easy to distinguish the former, from those of the Islamic period on the basis of small sherds found on the surface and from most excavations. However, there seems to be little other evidence of long distance maritime trade into southern and eastern Asia before about A.D. 700[4] and the context of most of the finds in South, Southeast and East Asia suggests that most, if not all, fall into the Islamic period although the beginning of the trade is still much debated. Some, but again, probably not all, were made at or around Basra (Mason 1991a: 200, 1991b: 57) but the site which has produced the best stratified sequence and where they have been most intensively studied is the port of Siraf in Iran (Whitehouse 1979) where most finds date from the ninth–eleventh centuries (Period 3-6) although there is also some Sassanian and early Islamic, as well as later occupation.

Among the ninety-six ceramic samples from Siraf analyzed by Mason well over a third belong to turquoise-glazed vessels or lids (Mason 1991b: tables 1 and 2) which are attributed to seven 'petrofabrics' some of which match the composition of kiln furniture from Basra while others are sufficiently different to suggest several manufacturing centres, but all probably in Mesopotamia. Mason's work on the petrography of Sassanian-Islamic fabrics will be enormously useful for identifying the sources of trade wares from further east — as well as from East Africa — but there is not yet enough comparative data available.

The TGW group found in Southeast and East Asia seems to include only jars, not bowls, and comes in various sizes with rim diameters ranging from 9-30 cm and vessel wall thickness from 0.7-2.7 cm. The fabric is soft, cream, or buff to grey in colour and the thick soda-lime glaze is coloured by copper with tin as an opacifier. The turquoise-glazed sherds form the majority of Sassanian-Islamic pottery collected in Southeast and East Asia but Ho (1994) comments that this may be because they are more visible when field walking. In the samples from her controlled excavations at Ko Kho Khao and Laem Pho, however, TWW sherds were more numerous.

In this paper I will concentrate on the finds from Southeast and East Asia although mention must be made of the finds made by several researchers along the East African coast and its offshore islands, in India by Carswell (1978); at Mantai in Sri Lanka (Carswell and Prickett 1984); and from the excavations at Anuradhapura in Sri Lanka.

Several authors have written on trade in West Asian ceramics to Southeast Asia especially Mikami (1984), Aoyagi (1991), Ho (1991, 1994), (Bronson 1996) while Feng (1986) and Ho (1993, 1994, 1995) and Zhang (1985; Zhang *et al.*1992) — as well as other Chinese authors — have described some of the finds of Sassanian-Islamic pottery found in China.

The Japanese ceramicists Mikami and Aoyagi seem to have been the pioneers in recognising the implications of these finds although Ho's 1993, 1994 and 1995 reports are the most extensive and comprehensive. Much of the information in the following sections of this article is drawn from Ho's work as well as from Bronson (1996). To this I have added the finds made by our joint Vietnamese-British-Japanese team working in Vietnam since 1993; reports on research in Sri Lanka; information on finds in Japan provided by Asoka Morimoto, and some later personal observations made in Eastern India and Thailand in the late 1990s.

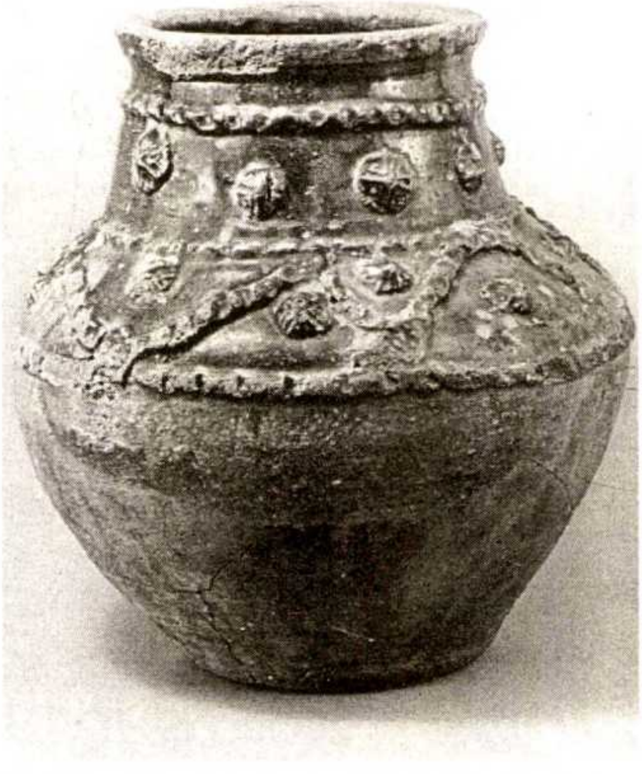

Fig. 3: Early Sassanian-Partian turquoise glazed jar from Iran, perhaps 2nd, 3rd century A.D. (photo by I. Glover), (colour slide)

In most sites where Sassanian-Islamic pottery has been found, it occurs together with Tang wares such as Changsha white wares and Yue type celadons and in Southeast and East Asia it forms only a small proportion of any assemblage. It is also predominantly coastal in distribution in contrast to the Tang wares which seem to have penetrated further inland. This, however, may be simply a function of sampling and the small numbers of Sassanian-Islamic pottery identified where it does occur.

Ho (1994) mentions twenty-three sites in Southeast and East Asia where Sassanian-Islamic ceramics have been found, and more can now be added (Fig. 4). She mentions ten locations in the Thai-Malay Peninsula, two in the Philippines, one in Sumatra, one in Vietnam (to which we can add three more), five in Japan and four in China. She points out most are on the main arteries of trade and always form a small proportion of imported ceramics. At Laem Pho some 400 West Asian sherds were recovered in contrast to about 4000 of Chinese wares. From the 1992-93 season at Palembang only twenty West Asian sherds were found as against about 1000 from China, and in Japan — the furthest to the east that they have been documented, less than fifty West Asian sherds have been found.

Nevertheless, despite the relatively small numbers so far found these ceramics are potentially very useful for correlation and cross dating and more attention needs to be paid to them. It is convenient at this stage to summarise the finds by the main regions and by country.

The Comorros, East Africa and Madagascar[5]

Sassanian-Islamic pottery has been found in many sites along the East African coast and the four Comoro islands (Dembeni in Maore, Mwali Mdjini in Mwali, M'bashile in Ngazidja, Sima in Nzuani) as well as at many sites along the East African coast as far south as Kwagandaganda near Durban in South Africa (Whitelaw 1994: 34). Its first occurrence is much debated at the moment, some archaeologists, such as Chami (1994) consider that it might have been imported earlier than the mid ninth century although most excavators prefer a lightly later date. A difficulty, as mentioned earlier, is to be sure that one does not mistake the turquoise-blue Sassanian-Islamic pottery with a closely related Sassanian and even the Parthian pottery. In a recent paper, Horton (n.d.) has queried whether the dramatic increase in trade in the Indian Ocean following Islamic control of the Red Sea and Gulf ports as postulated by Whitehouse, really happened since local ceramics were already being traded to many sites along what later came to be known as the Swahili Coast. But although some of these sites included North African and Mediterranean Red Slip wares of the fifth–sixth centuries, glazed ceramics of the Sassanian-Islamic tradition do not seem to appear before the ninth century.

Allibert's excavations at Dembeni 1 in the Comorros, however, (Allibert 1989; Allibert *et al.* 1989) gave a perfectly clear stratigraphy with layers showing Sassanian-Islamic sherds in association with Chinese Tang sherds (Yueh, Dusun and white porcelain) and Islamic tin-glazed ceramics that were dated to A.D. 850-880 (see also Wright 1984), and these finds correlate well with Monique Kervran's (1977) excavations at Susa in Iran which were closely dated by the associated coins. One sherd was also found at Irodo on the northeastern coast of Madagascar, but has been lost (Battistini and Verin 1967).

Chittick's (1974) excavations at Kilwa and Manda (Chittick 1989; Horton 1984) produced evidence of many sherds of Islamic lustre wares and tin-glazed pottery associated with Tang sherds. This research indicates that Sassanian-Islamic pottery does not seem to have been imported to the African coast after about A.D. 1025. Horton's (1996) research at Shanga and also that by Sinclair (1982, 1987) at Chibuene in Mozambique seems also to confirm this date.

Pakistan

The medieval walled city at Banbhore, on an abandoned river channel west of the Indus in Sind and some 60 km east of Karachi, has been investigated on several occasions since the mid nineteenth century. This may have been the ancient port of Debal conquered by the Arabs under Mohammed-bin Qasim in A.D. 712 and which remained a major entrepôt until the twelfth century. Excavations in the earliest Islamic levels by Khan (1960, 1963) revealed unglazed white wares with impressed Kufic inscriptions of the Umayyad period with coins of the tenth Umayyad Caliph (A.D. 724-43), and in the layer immediately above this there were numerous heavy, blue-green glazed 'Persian' storage jars (Fig. 3), typical examples of Sassanian-Islamic TGW. A reconstructed one of which (Fig. 5A, B) is illustrated on the cover of the excavation report.

Brahminabad, also in Sind, and 80 km northeast of the modern city of Hyderabad has also produced Middle Eastern wares with similar incised calligraphic decoration. As the site is thought to have been destroyed in an earthquake in A.D. 1020, this helps to date this material.

India

There are remarkably few reports clearly identifying early Islamic imported wares although I feel that they must be abundant, especially on the west coast. The excavation report on the important early port of Dwarka in Saurashtra

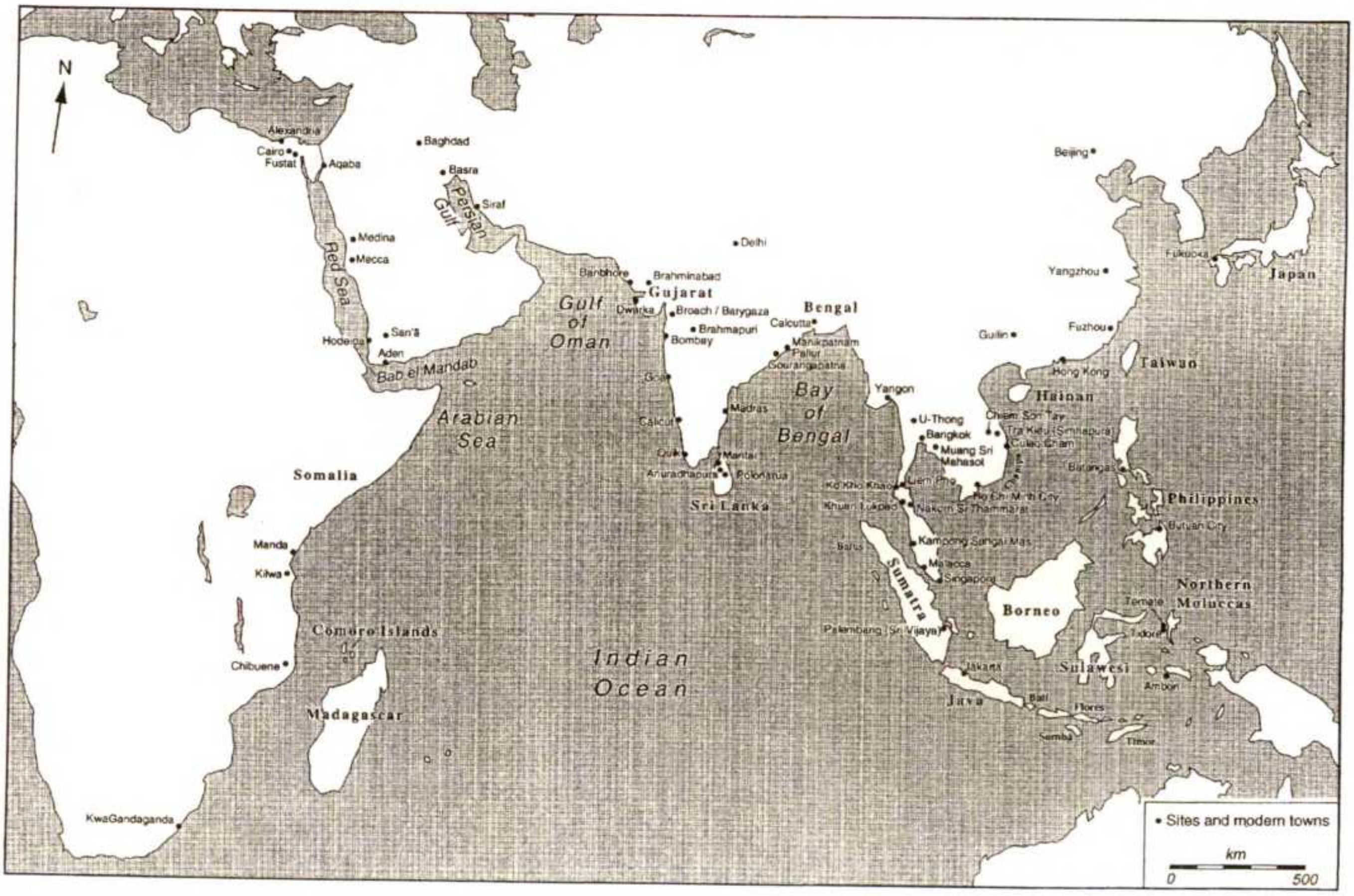

Fig. 4: Map locating main archaeological sites mentioned in the text, and some modern cities and other locations (B & W line drawing)

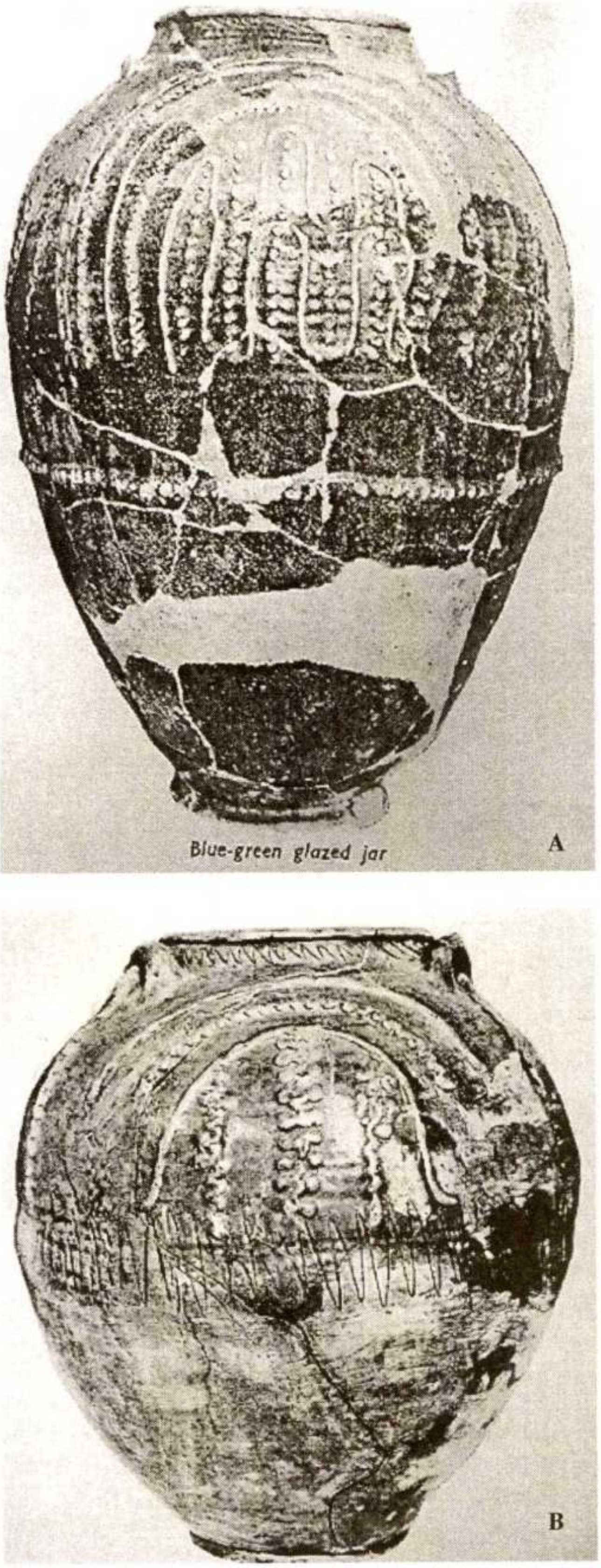

Fig. 5 A and B: Two turquoise glazed jars from Banbhore, Pakistan (from Khan 1963, p. 33), (B & W prints from digital images)

(Ansari and Mate 1966: 29-30, 200-2) mentions glazed ware and polychrome glass bangles in period IV, 'perhaps taken by Iranian Muslims to India and which are absent from earlier levels'. A starting date of the 10th century is suggested. However the descriptions and illustrations are not sufficiently precise, mentioning only a 'glass glaze' and a 'compact light red core' which does not sound like TGW.

From their excavations at the site of Brahmapuri (Kolhapur) in Maharashtra, Sankalia and Dikshit (1952: 56) mention a few fragmentary sherds of 'glazed pottery with a buff or creamy yellow core and a greenish surface in different shades' confined to layers 3 and 4 and comment that this, together with 'evidence from other sites in India points to their foreign importation probably through Persia with the advent of the Muslims'. However, they date the site to the Bahamani Period (A.D. 1435-1700) which long post-dates the earliest Islamic trade.

Apart from these ambiguous descriptions, my principal source of information on India has been Carswell's (1978) report of a survey of twenty-five ancient port sites along the east coast. Although he gives few specific details of the numbers, locations and range of West Asian ceramics, Carswell (personal communication, May 1996) mentioned that there was a large range, including LW, TWW and TGW vessels at many locations.

Finally, I should mention a brief visit to Orissa in March 1998 when I was able to recognise a few sherds of TGW among an excavated assemblage from Manikpatna and Pallur at the northern end of Chilka Lake, and among surface finds from at Gourangapatna near Rambdha near the centre of the west side of Chilka Lake, so one might expect to find more such material along India's eastern seaboard if it were looked for. At the meeting in Lyon, in July 1996, when a version of this paper was first presented, Sengupta mentioned that there were many TGW sherds from sites in Bengal but these may be from a different source, or a different fabric as the sites were thought to be from the thirteenth–fourteenth century A.D.

Sri Lanka

Carswell's 1978 report is again short on specific details from his survey of 24 port sites in Sri Lanka but from the 1980-84 excavations at Mantai (Carswell n.d.; Carswell and Pricket 1984) mention the recovery of over 300 sherds of West Asian Sassanian-Islamic ceramics including TGW, LW, WTW and some other wares in small number. Turquoise-glazed jars were most numerous (180) and in contrast to the situation at sites in the Thai-Malay Peninsula described below, West Asian ceramics outnumbered imports from China.

Other details for Sri Lanka are available from Coningham's British-Sri-Lankan excavations at

Anuradhapura (Coningham 1999); (Seeley n.d.) where LW, TWW, Green and Yellow lead-glazed wares and TGW were all found in levels attributed to Periods B-D; roughly dated to between the eighth–thirteenth century. Bopearachchi (1996: 72) also mentions a single piece of Near Eastern glazed ware from Polonnarua.[6]

Thailand

Sassanian-Islamic pottery has been found in excavations by the Thai Fine Arts Department and Field Museum of Natural History at Ko Kho Khao[7], a site covering some 400 ha on the west coast and at Laem Po near Chaiya on the east coast (Bronson 1996; Ho 1993, 1994) (Fig. 6). The two sites are said to have been occupied for only a few decades between A.D. 800-900 when, for some reason, the main east-west trade route crossed the Kra Isthmus by land rather than passing by sea south of Malaya (Bronson 1996). These two have also produced the largest quantity and range of Near Eastern ceramics from any site east of Sri Lanka including TGW, TWW, green and white, yellow lustre and cobalt blue-and-white wares (Bronson 1996). Ho also reports that the Thai Fine Arts Department has found many more TGW sherds from a number of sites in this region such as Tha Rua near Nakorn Si Thammarat, but few details are available. Ho suggests that the pottery was brought directly to Ko Kho Khao from West Asia either by Arab or Indian traders since a South Indian style tank has been found which is also referred to in a local Tamil inscription written in a South Indian 9th century script (Bronson 1996).

A few West Asian sherds have been found at Muang Sri Mahasot near Prachinburi (Fig. 7); at Tha Chana, 15 km south of Laem Pho on the east coast, and a few more on the surface from disturbances caused by bead diggers at Khuan Lukpad near Khlong Thom, Krabi Province. Both at this site and Laem Po, the remains of blown glass vessels seem to be more common than the TGW ceramics. It is difficult to tell from cursory inspection — especially when it is in museum cases — whether this glass is late Roman, Sassanian or Islamic. Since finds at Khuan Lukpad run from about the second to about the eleventh century A.D. it could be any of these.

Ho also mentions some inland sites in Thailand, U-Thong, Sa Morakot, Muang Sri Mahapho, Yarang and Muang Phrarot where just one or two sherds of West Asian ceramics have been found (see also Jacq-Hergoulac'h 1995). She speculates that since they are so rare in urban and political centres of seemingly thriving and wealthy principalities that West Asian ceramics may have been used primarily by foreign traders confined to coastal trading enclaves. Such a pattern was common in East Asia and virtually all the examples from Japan have come from the Heian Period Korokan at Fukuoka.

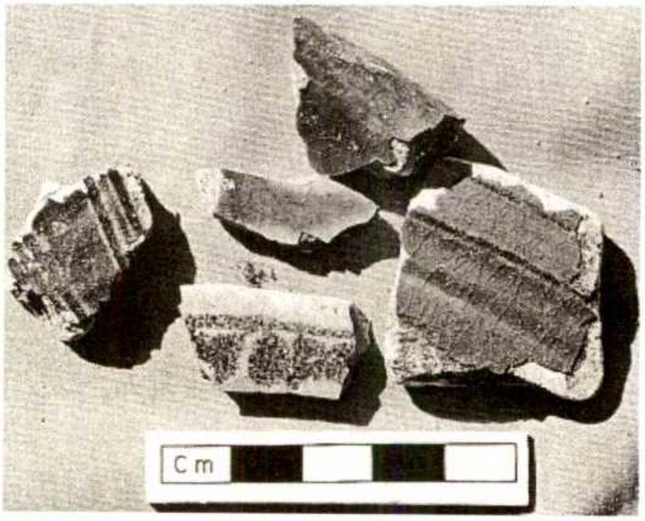

Fig. 6: Turquoise and cobalt blue glazed sherds from Kho Kho Khao, Takuapa, Peninsular Thailand, (photo by I. Glover), (colour print)

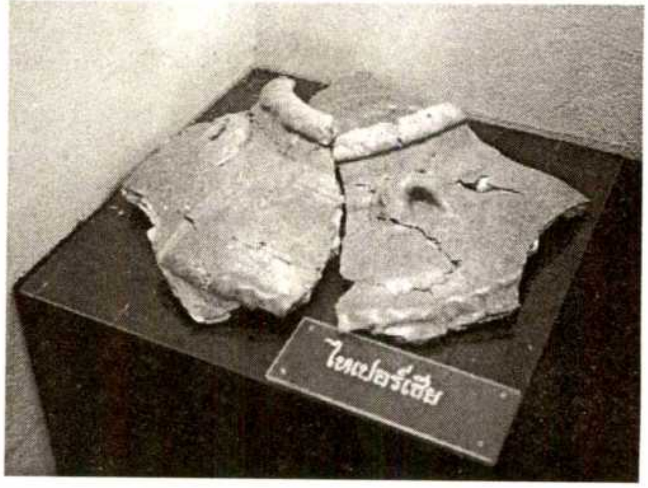

Fig. 7: Turquoise glazed sherds from Muang Sri Mahasot, Prachinburi, Thailand, (photo by Frank Manly), (colour slide)

Malaysia

Two major sites in southern Kedah are reported to have produced West Asian ceramics, Kampong Sungei Mas on the Sungai Terus (Fig. 8), and Kampong Pengkalen Bujang, a few kilometres to the north on a tributary of the Sungai Merbok. Some sherds are illustrated by Nik Hassan Shuhaimi and Othman Mohd. Yatim (1990: Pls. 34-5) and more details are provided by Jacq-Hergoulac'h (1992: 200-4). As in southern Thailand, large quantities of Islamic glass were also found at these locations. Lamb (1965, 1966) discussed this material quite extensively and his conclusions, together with later finds, are summarised by Jacq-Hergoulac'h (1992: 261-6). The dominant West Asian ceramic, as described by these authors are TGW and Splashed-sgraffiato ware attributed — perhaps dated a bit too early — by Nik Hassan the to seventh–eighth centuries and, as in southern Thailand, the Sassanian-Islamic pottery is outnumbered by Tang ceramics from China.

Philippines

TGW sherds and fragments of glass vessels have been found in excavations at the Balangai 1 site, Butuan City, Mindanao. Ho (1994) compares this material with the ninth century finds from Ko Kho Khao and Laem Pho. Aoyagi (1991: 37) places them later, to about 10-12th century; but if the pottery is really associated with the Butuan boats it might be later still since Manguin (1996: 186) quotes radiocarbon dates from the boats themselves which place all but one of them to the thirteenth century. Together with this material were some Tang ceramics and the base of a jar of Egyptian 'Three-Coloured Ware' supposedly made in the Faiyum region in ninth-tenth century. This is the only example I have come across of Islamic Egyptian rather than Mesopotamian glazed ceramics in Southeast Asia. Some West Asian pottery is also reported at Batangas in Luzon (Mikami 1990) but few details have been published.

Indonesia

Manguin's excavations at Palembang yielded some 30 West Asian sherds (only 0.6% of the total pottery) from the period I am concerned with. These include TGW, TWW and yellow-enameled ware dated to between A.D. 850-900 and a few sherds of lustre ware from the 10th-11th centuries layer (Ho 1994; Manguin personal commuication, July 1996).

Excavations between 1995-95 at Lobo Tua near Barus on the northwest coast of Sumatra produced a little more than 600 sherds of Near Eastern pottery in contrast to over 8500 pieces of imported Chinese wares. Only a few of these belong to the chalky-white bodied TGW (Fig. 9) while the majority have a reddish body with decoration incised through a clear glaze. In addition to the excavated assemblage surface finds of TGW, lustre ware and Near Eastern glass vessels seem to be abundant at Loba Tua and, as at Ko Kho Khao there is a nearby, although rather later, Tamil inscription dated to A.D. 1088 (Subbarayalu 1998).

These two locations seem to have yielded the only material so far documented in Indonesia. In Central Java where quite a number of Tang ceramics have been found no Western Asian pottery has been reported. This echoes the situation in the Thai-Malay Peninsula where the distribution is essentially along the coasts.

Vietnam

Ho mentions only one site, Cie Lao Cham (*sic*), which she calls 'a small island off the coast of Binh Dinh Province, central Vietnam'[8], and to this have added the few TGW sherds from Chiem Son Tay and Tra Kieu in the Thu Bon Valley and from Hoi An at the mouth of the river.

Cie Lao Cham is most probably Cu Lao Cham in Quang Nam Province and excavations at Bai Lang village on the western coast of the small island by Lam My Dzung and a team from Hanoi National University starting in 1998 have produced abundant Middle Eastern glazed sherds including TGW (Fig. 10) and green-on-white ware together with much Islamic glass, beads and Tang Chinese ceramics (Lam My Dzung n.d.; Glover 2000).

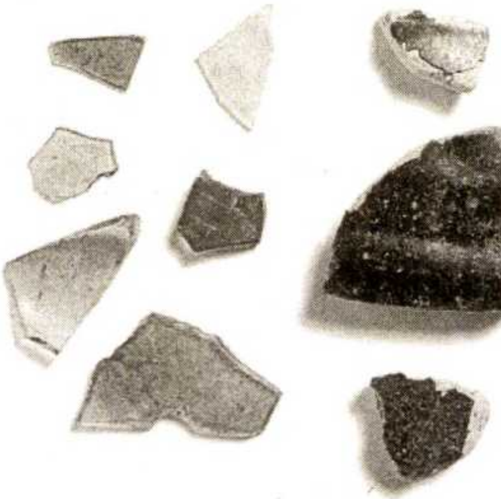

Fig. 8: Turquoise glazed sherds and Islamic glass from Kampong Sungei Mas, west coast of peninsular Malaysia, found with Chinese ceramics of 11th–early 12th century, (photo and surface collection by J. Wisseman Christle), (colour slide)

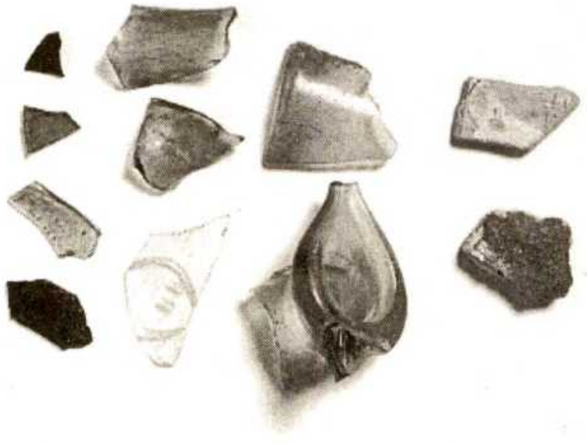

Fig. 9: Turquoise glazed sherds and Islamic glass from Lobo Tua, Barus, northwest Sumatra, Indonesia, (photo and collection by J. Wisseman Christle), (colour slide)

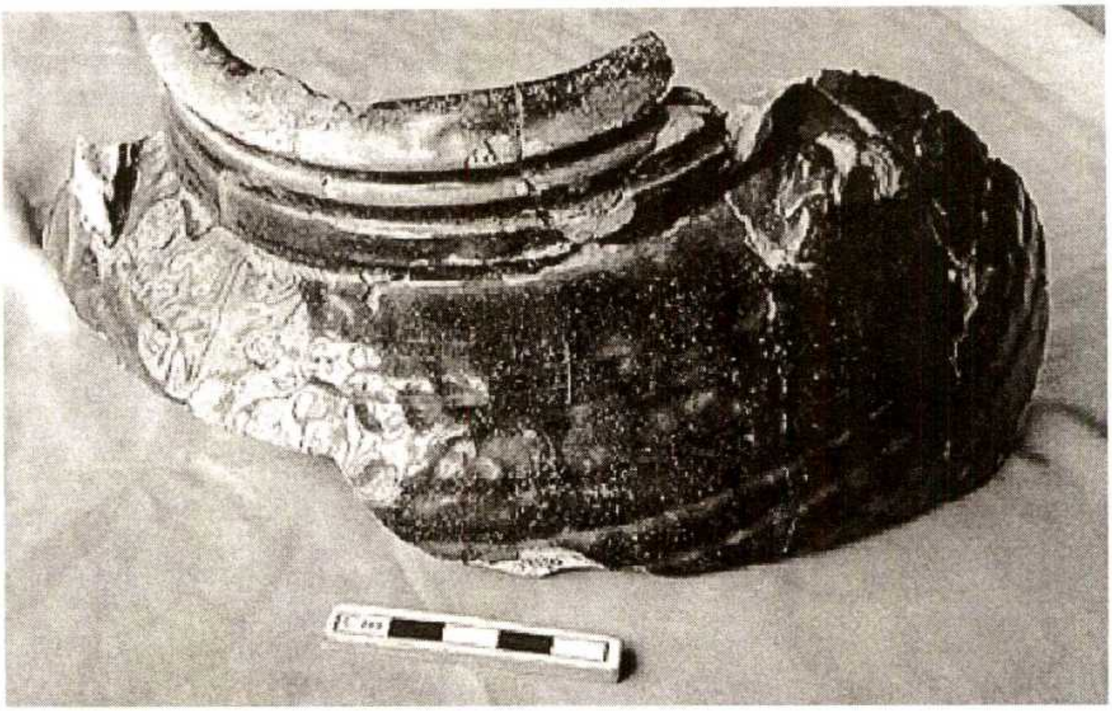

Fig. 10: Turquoise glazed sherds from Bai Lang, Culao Cham, Quang Nam Province, Central Viet Nam, (photo by I. Glover), (B & W print from digital image)

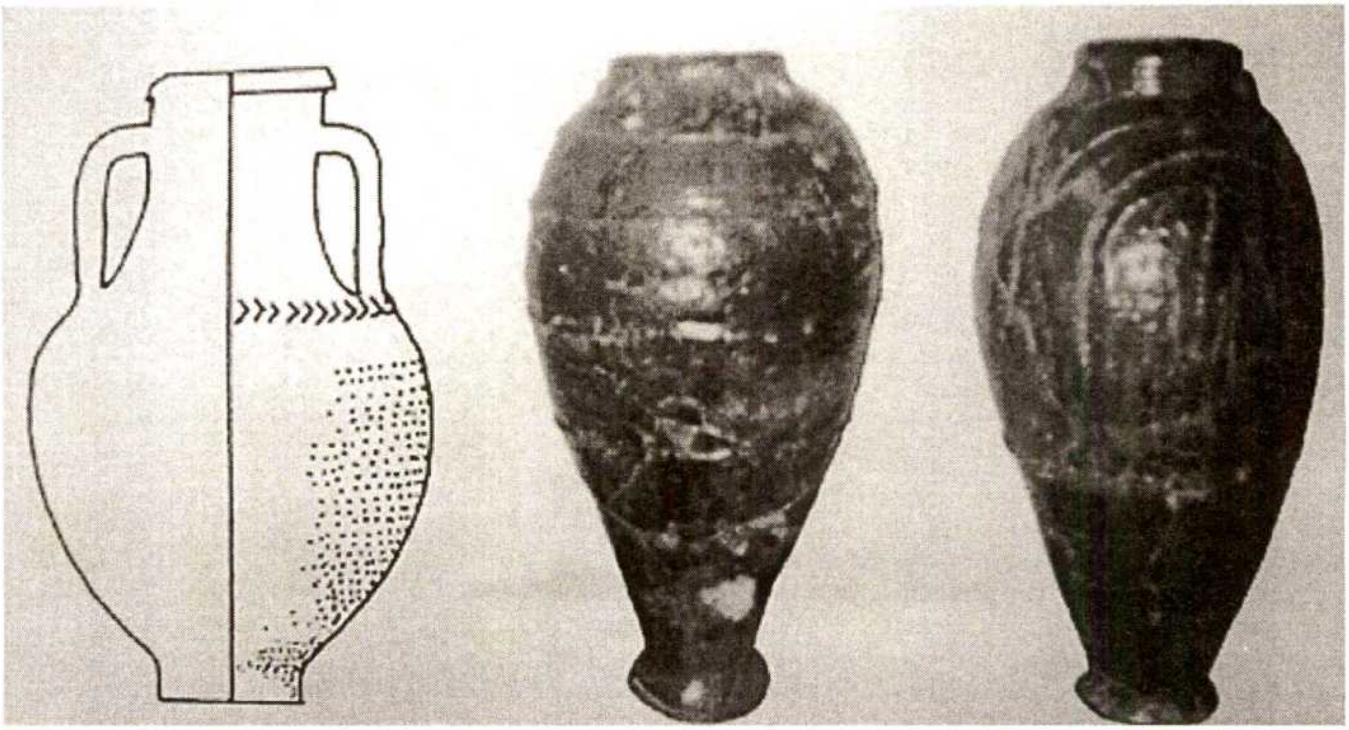

Fig. 11: Islamic turquoise glazed jar from Liu Hua's 10th century tomb Fuzhou Province, China (from Feng 1986), (B & W prints from digital images)

Con Dau Island (Vung Tau Province) in southern Vietnam has also produced one early Western Asian glazed sherd amongst a lot of seventeenth–eighteenth century Chinese porcelain (Asako Morimoto, personal communication, 1996).

All these locations with the exception of Con Dau, are essentially Cham cultural sites with abundant low fired unglazed earthen wares and, in their later stages, quite numerous imported Chinese wares.

China

More Western Asian glazed ceramics have been reported from China than any other part of East Asia and this probably represents that countries position as the terminus of most of the old world's trade routes. Again most finds are near the coast, and especially to the great trading cities where Arab and Persian merchants had settled in considerable numbers. Ho (1995: 21) mentions at least 300 sherds and several complete vessels.

Both Zhou (1985) and Feng (1986) discuss three 'blue-green glazed Persian' vases (Fig. 11) found in the tomb of Liu Hua at Lotus Peak, Fuzhou, Fujian Province which is dated to A.D. 930[9]. The jars had been placed on pedestals in the front chamber of the tomb and may have been filled with oil as 'everlasting lamps' — a common practice in Chinese Buddhist burials of this period. These are probably Mesopotamian products of the Basra kilns. Feng (1986) also illustrates a dark-blue glazed vase with two strap handles excavated at Yangzhou, Jiangsu Province which he dates to the twelfth-thirteenth century, but it is probably earlier than this[10]. The squat, amphora-like shape, neck and handles suggest that it is more probably pre-Islamic; Sassanian, if not Parthian in origin even if its deposition in Yangzhou was much later.

Several hundred sherds of what seem to be more certainly Sassanian-Islamic TGW are also reported in some quantity at a construction site on San Yuan Road, Yangzhou (Feng 1986: 48; Zhou 1985). The latter are also dated by the authors to the twelfth-thirteenth centuries although they are more likely to have been made between eighth–tenth centuries as Ho (1994) indicates. She also points out that Yangzhou was one of the three main cities of Tang China known to have a substantial number of Arab and Persian traders from as early as the eighth century who were engaged in a range of commercial activities.

Ho (1994, 1995: 21) notes that of the West Asian ceramics only the TGW has been reported from China and in addition to the sites mentioned a few others have been found in the grounds of old Buddhist monasteries at Yongxian and Guilin in Guangxi, Province, both some distance from the trade routes linking China and the west. Surprisingly though none are reported from Changan or Guangzhou, both cities with a substantial number of traders from the west, and the latter was always the main Chinese customs port and link for trade to the southern and western Asia. Ho comments (*ibid.* 35, n.5) that this absence in the known archaeological record, may be due to the huge urban expansion of recent centuries which have destroyed the earlier settlements.

In the later parts of a thoughtful and insightful paper Ho (ibid.) focuses on the influence of these early imports from the Muslim world on Chinese ceramic traditions, something which has been somewhat overlooked by previous ceramic specialists.

Zhang *et al.* (1985) made a chemical compositional analysis of three samples of TGW from Yangzhou and described them as low in silica and alumina and high in lime, magnesia and soda with a firing temperature at about 1070 °C, well below that of contemporary Chinese wares. The use of copper and tin also serves to distinguish the glazes from typical Chinese ones. Because of the different approaches to analysis followed by Mason for the Siraf material and Zhang and his colleagues for the sherds from Yangzhou it is difficult to make exact comparisons of the two fabrics.

Japan

Several excavations at seventh-eleventh century sites in and around Fukuoka/Hakata City in northern Kyushu have yielded West Asian glazed ceramics. These include the *Korokan;* a guest house for receiving foreigners (about forty-seven TGW sherds) (Fig. 12), among a very large amount of Chinese material; the ancient port site of Hakata City (eight sherds); Tatara-Koneta (one sherd); Dazaifu, the western capital (ten sherds) and Kurume Kokufu, a regional administrative centre (three sherds). One Western Asian sherd has also been found at the Harunotuji site on Ikii Island in the Tushima group between Korea and Japan.[12] The numbers may be small, but they are widely scattered in this region and to find any in this area is a surprise since historical records indicate that only Chinese and Korean traders were allowed to reside there. Perhaps a few ceramic vessels were carried on from China as novelties, or maybe the records reflect the intention of the Heian rulers rather than the reality; a not uncommon situation when comparing archaeological and historical data.

The Function of West Asian Pottery in East Asian Sites

Ho (1994, 1995) speculated on how the various West Asian vessels may have been used. She suggested that the TWW bowls were probably eating and serving utensils for the Arab and Persian traders with only a few passing into local hands. But the more common TGW jars (some up to 70 cm high) are more likely to have been containers for products such as dates, nuts, cane sugar, oil and pitch as is recorded

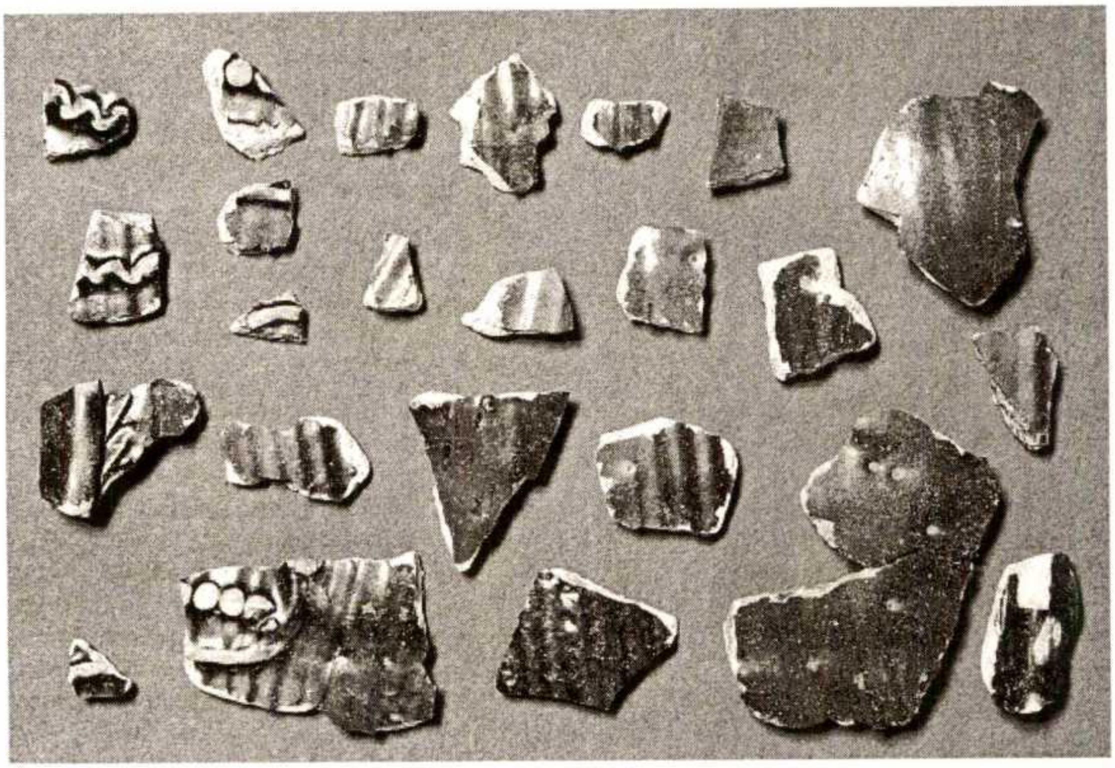

Fig. 12: Turquoise glazed sherds from excavations at Korokan Guest House, Fukuoka City, Kyushu, Japan, (photo by Asako Moromoto), (colour print)

for the trade to East Africa. Perhaps residue analysis of freshly excavated, but unwashed, sherds may help to resolve this in future.

Since the absolute quantity of West Asian ceramics, and the proportion relative to contemporary Chinese material, is so low in eastern Asia, Ho's suggestion that these ceramics were not really trade wares themselves, but were taken along by western traders, primarily for their own domestic use makes good sense, at least for the situation in the Thai-Malay Peninsula. The fabric and glaze was inferior to that on Chinese stonewares and it clearly never gained much acceptance by the indigenous peoples along the trade routes from West Asia to the Far East. But that it was sometimes valued is shown by an ancient repair made to a TWW bowl excavated at Ko Kho Khao - perhaps for an Arab merchant with a sentimental attachment to an object from his homeland.

Another pattern is discernable in the distribution. From Siraf, through India to Sri Lanka, quite a large range of forms, fabrics and glazes of Sassanian-Islamic pottery are found including some LW, TWW bowls and the TGW jars which are more frequent than imports from China. In the Thai-Malay Peninsula LW seems to have dropped from the inventory and from Vietnam north to China and Japan virtually only TGW jars have been reported. This does not quite fit Ho's suggestion that the West Asian pottery was almost exclusively for the domestic use of Islamic merchants, since we know that China had large colonies of such merchants from the 8th century and yet their supposed domestic utensils have not been found there.

By the 12th century West Asian ceramics seem to be no longer present in sites in Southeast and East Asia although merchants from the west still came. Perhaps the explanation is to be found in the recognition of the superior qualities, and mass production of Chinese ceramics which from then on monopolised the market. An Arab merchant from Siraf arriving in Guangzhou at this time, wrote "The Chinese have ceramics. Although they are called 'ceramics' they have the delicacy of glass and the brightness of water" (Sulayman and Zaid 1976) — a clear reference to porcelain. Western ceramics could not compete with this until the eighteenth century, and then only by copying the composition and firing methods of the Chinese potters.

Endnotes

1 According to Rougelle the first Chinese ceramics to reach Western Asia are Tang olive green stonewares, in the Ummayad, pre-mosque level at Siraf and at Sohar in the first Islamic period. With the Abbasid move to Mesopotamia trade with the Far East developed and Chinese wares become quite frequent from eighth century. The demand they created was soon exploited by local potters, first by imitating and then developing new varieties of glazed wares.

2 The coin was identified by Venetia Porter of the Department of Coins and Medals of the British Museum as an Abbasid dinar of the Caliph al-Muktafi billah (r.289-95 AH/AD 902-8) It was minted in 291 AH (AD 904) in Hamadan in present-day Iran in the name of the Vizir Wali al-Dawlah.

3 Moira Tamboe (1989) who studied the huge corpus of ceramics from Siraf describes thes as 'Blue-Glazed ware', but comments (ibid 31) that they are often turquoise — blue in colour and I use this label here.

4 Coins and other small finds, of course, reached Pakistan, India and more rarely Sri Lanka, before this.

5 I am indebted to Claude Allibert of the Centre d'Etudes et de Recherchea sue l'Océan Indien, INALCO, Paris for pointing me in the direction of the materials from East Africa, Madagascar and the Comorros Islands, and for providing most of the references to this section.

6 Osmund Bopearachchi also kindly directed me to some recent excavation reports (Bopearachchi and Wickremesinhhe 1999 and Weisshaar *et al.* Eds 2001) which are not available to me at the time of writing.

7 Ko Kho Khao is also sometimes referred to in the literature as Tung Tuk (Bronson 1996).

8 It is probable that the 'Mt. Cie Lao Cham' referred to by Ho in Binh Dinh rovince is the same as Culao Cham (Cham Island) off the Thu Bon estuary in Quang Nam — Da Nang Province; Binh Dinh Province is much further south. The Japanese archaeological team working in Hoi An told us in 1995 that they had found four Sassanian-Islamic TGW sherds on this island.

9 Ho (1995:25) notes that the owner of the Fuzhao grave, Li Hua was the daughter of a king of an independent state of the Southern Han in present-day Guandong province who married the King of Min in Fujian Province. She died in A.D. 930 and was buried the same year with three turquoise blue glazed jars placed in the antechamber of the tomb. Li Hua's tomb provides the most secure single date for TGW in the Far East.

10 I am not sure whether or not one of these vessels is the same as one illustrated in AISF (1985, 152. fig.1. Although the illustration here is very poor the form of these amphora-like vessels would suggest that they are late Parthian to Sassanian in date.

11 Information kindly supplied and updated by Asako Morimoto and Mr Nobuo Yamamoto, pers. comm. August 2001.

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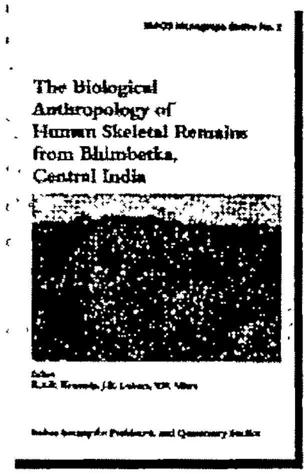

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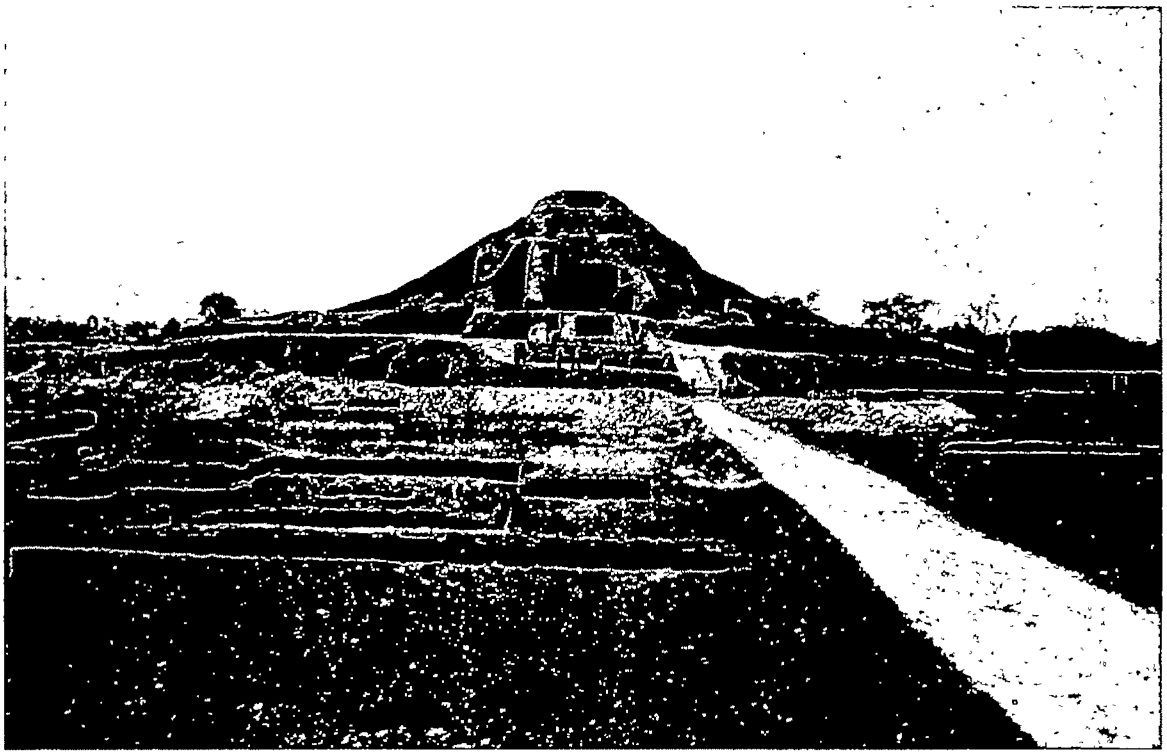

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Editorial

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This issue of the Journal, like the previous ones, contains articles on diverse subjects. Rakesh Tewari and his colleagues report the evidence of Middle Palaeolithic artefacts and Upper Pleistocene climate at Kalpi in the Yamuna valley in Uttar Pradesh while Sukanya Sharma discusses the geomorphic context of stone tools at two sites in Meghalaya. Gudrun Corvinus reports a Middle Palaeolithic site from the Deokhuri valley in Western Nepal, and Sheena Panja and her team report the preliminary results of their geoarchaeological investigations in West Bengal. U.B. Mathur examines the chronology of Harappan port towns in Gujarat in the light of Holocene sea level changes. Other subjects covered comprise evolution of settlement types, material culture, and urbanism in early historic Gujarat by Kalini Khandwalla; subsistence during the historic period in coastal Orissa by Arati Deshpande-Mukherjee and Jeetu Mishra; newly discovered rock paintings and other antiquities in Chandauli district, U.P. by Rakesh Tewari and R.N. Singh; graffiti marks at two Megalithic sites in South India and Sri Lanka by K. Rajan and O. Bopearachchi; living megalithic culture of the Madia Gonds of Eastern Maharashtra by Shaunak Kulkarni; and a note on the cultural importance of ethnographic objects by Nilanjan Khatua.

We hope that the articles will be found useful by our readers.

The issue also contains obituaries of Ajay Mitra Shastri, Shiba Charan Nanda, Bindeshwari Prasad Sinha, and Peter Francis, Jr. who passed away during 2002. The Society and the Journal pay their homage to these archaeologists.

With this issue we have tried to restore the schedule of the Journal which was considerably affected by the long delay in the publication of the previous issue.

A monograph comprising the proceedings of an international workshop on the introduction of African crops into South Asia, edited by V.N. Misra and M.D. Kajale, will be published by the Society in April, 2003. Like the monograph on the human skeletal remains from Bhimbetka, published in 2002, this one too will be available to Society's life members at discounted price.

We would like to inform our readers that the next two annual conferences of the Society will be held under the auspices of the Department of Anthropology, S.V. University, Tirupati in 2003, and the U.P. State Department of Archaeology, Lucknow in 2004. The readers will hear about the dates of the conferences from the organizers in due course.

Articles can be submitted to the Journal via eamil to the address: ispqs@indiatimes.com

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Middle Palaeolithic Human Activity and Palaeoclimate at Kalpi in Yamuna Valley, Ganga Plain

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Abstract

Lithic and bone artefacts, chronologically assignable to the Middle Palaeolithic, are recorded from the Kalpi section in Yamuna Valley. These artefacts have been recovered from a stratigraphically constrained sediment horizon dated by Infrared Stimulated Luminescence (IRSL) technique to around 45 kyr. The lithic artefacts are made mostly on 2-4 cm size quartzite pebbles, and consist of pebble tools, cores, un-retouched pebbles, broken pebbles, atypical points, side-scraper, and chips; and occur in a limited area. The bone artefacts far exceed the lithic artefacts in number and are spread over a few hundred metres. The bone artefacts are end-scraper, point, notched tool, burin, atypical end scraper and bones with cut marks. Special mention can be made of a large mammal vertebra and animal skull showing cut marks used as anvil, and a triangular point with a fire hardened tip. The bone artefacts invariably show some evidence of charring. Along with the bone artefacts a large number of bone pieces and teeth of vertebrates have been recovered. A 3.54 m long elephant tusk and 1 m long elephant shoulder blade are significant. Rich faunal remains in this horizon indicate a humid climate with strong monsoon around 40-45 kyr, which is also supported by the mineralogical-geochemical data. This is the first record of Middle Palaeolithic human occupation of the Ganga Plain.

Introduction

The Ganga Plain, presently one of the most densely populated areas of India, has a large number of archaeological sites, mostly going back to about 2500-3500 yrs B.P. Until about three decades ago it was thought that the Ganga Plain was unsuitable for the Stone Age human habitation. The discovery of a series of supposedly Epi-Palaeolithic and Mesolithic sites in the Pratapgarh, Allahabad, Jaunpur and Varanasi districts of Uttar Pradesh belied the above observation and the scholars in general seemed to have accepted the hypothesis that the Stone Age people of the Vindhyan area migrated towards the north in search of food during the Terminal Pleistocene and Early Holocene (Sharma 1975: 13-15; Sharma *et al.* 1980: 121).

However, the occurrence of Lower and Middle Palaeolithic human activity in the Ganga Plain has been beyond the imagination of scholars, particularly because of the monotonous spread of alluvium mostly devoid of suitable stones, the raw material for manufacturing implements. The meticulous field investigations carried out by the team of the Department of Geology, Lucknow University into the sediments of the Yamuna river-section between the railway and road bridges near Kalpi, District Jalaun (Fig. 1) during the last five years have proved beyond doubt that human groups occupied the region around 45,000 years B.P. (Singh *et al.* 1999; Singh 2001, 2002). Moreover, as per the observations of this team, the stone and bone implements occur in a definite stratigraphic horizon, which has been dated by various absolute dating methods. This artefact yielding horizon is present in Event II which also produced a variety of vertebrate faunal remains, namely elephant tusk, shoulder blade of elephant, molars of *Equus*, bovids, *Bos* etc. which seem to suggest a humid climate during deposition of this horizon (Singh *et al.* 1999). This paper attempts to describe and classify these artefacts, and to discuss their significance in terms of human occupation history of the Ganga Plain. These artefacts are the first record of a Middle Palaeolithic tool industry in the Ganga Plain.

Previous Studies

It may be mentioned in this context that vertebrate fossil fauna has been reported from the river sections of both the

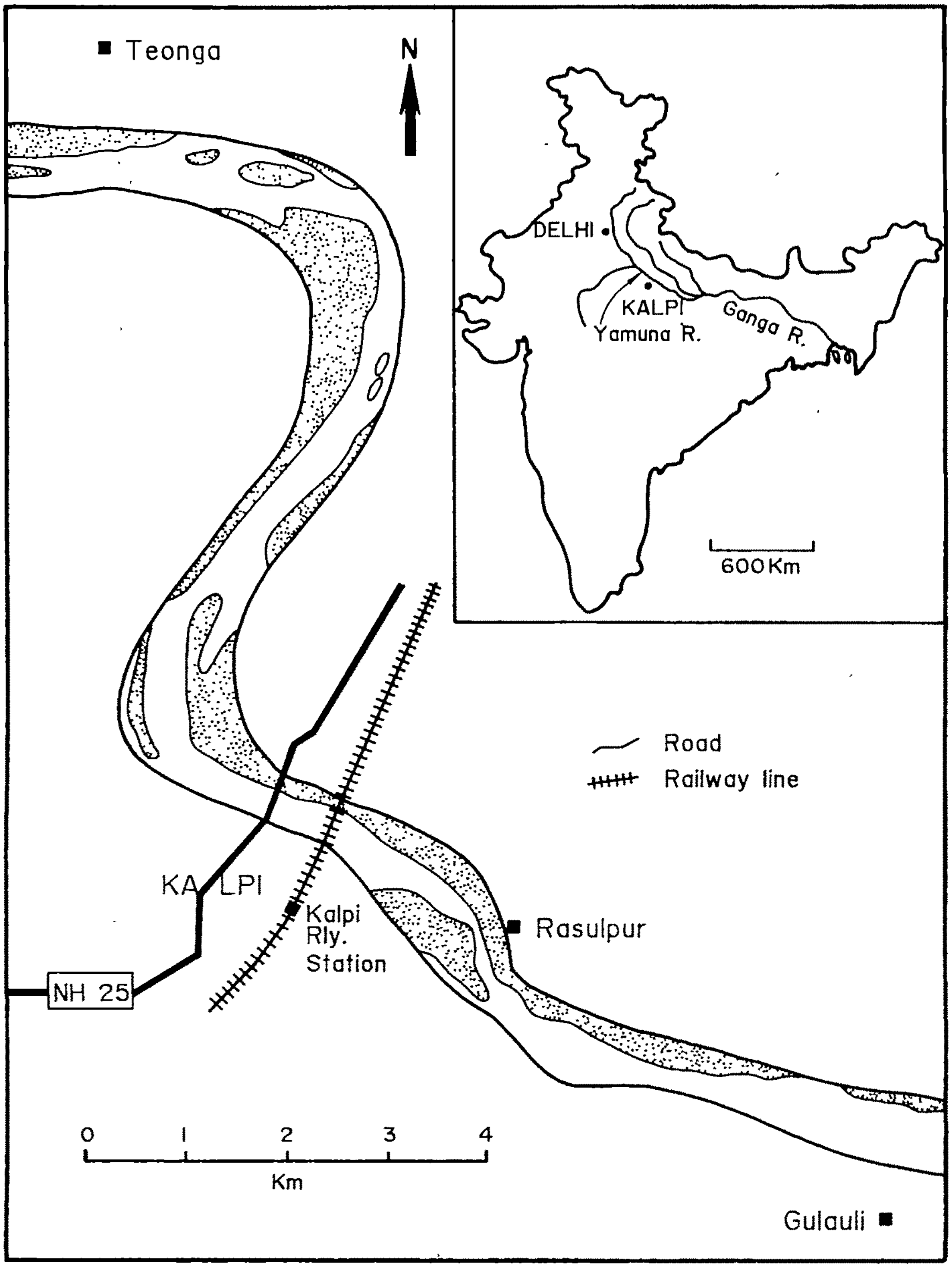

Fig. 1: Location map of the Kalpi section. The Yamuna river is sinuous with prominent sediment bars. The main part of Kalpi section is located between the road bridge of NH25 and the railway bridge along the southern bank of the Yamuna river.

Ganga and the Yamuna rivers since the earlier half of the nineteenth century. Duncan reported the existence of fossil-bones near Kalpi as early as in 1828 (Dean 1833: 623; 1835: 261-278). As reported by Dean, in and around the same area, Duncan, Royle and Smith also discovered quite a few fossils at about the same time (Dean 1833: 631-632). What appears to be most intriguing about Smith's observation is the probable presence of human bones in the assemblage. However, no detailed description of these bones is available, which puts a question mark to this record. Smith also noted the presence of angular pebbles of quartz in the *Kaṇkar*-bed of the section (Dean 1833: 622-635). Subsequently, vertebrate faunal remains have been found at different places along the axial rivers of the Ganga Plain, the Yamuna and the Ganga rivers, from time to time, in District Banda, Jalaun, Kanpur Dehat, Allahabad and Varanasi in Uttar Pradesh and Bhagalpur in Bihar (Mishra 2001: 195-97). Dean's reporting of the fossils of hippopotamus and camels from 'Jamna' (Dean 1833), Cockburn's discovery of mammalian remains from the older Pleistocene alluvium of the 'Jamna' in Banda (Lydekker 1882: 33), reporting of fossiliferous formation in Mau on the right bank of the Yamuna (Falconer 1865: 372-89: Sharma *et al.* 1980: 5), finding of the mid-Pleistocene fauna near the Ganga at Phaphamau near Allahabad by Pilgrim (1904: 176-177), the occurrence of *Stegodon* molar from older Gangetic alluvium of the 'Upper Pleistocene Age' near Prahladpur, district Varanasi, and a mandible of *Palaeoloxodon namadicus* from Tundiary *nala* south of Allahabad, as reported by Chakravarty (1931: 115-124; 1935: 364-65; 1937: 33-37; 1938: 143-45) and discovery of a molar *Stegodon insignia* near 'Jamna' at Naini in Allahabad recorded by Mukherjee (Mukherjee 1949: 85-88; Mishra 2001) are the examples which need particular mention in this regard. More recently a team of Geological Survey of India reported the occurrence of remains of fresh water organisms near Kalpi (Kumar *et al.* 1996: 173-207). Another team of G.S.I. reported the finding of vertebrate fossils in a large quantity from the Ganga alluvium near Bhagalpur assignable to "Early Pleistocene Period" (Verma *et al.* 1998: 35-40; Mishra 2001). Thus it is obvious that the fossils of various vertebrate animals are present in the alluvium exposed alongside and in the subsurface of both the Ganga and the Yamuna rivers, particularly the latter. However, most of these discoveries may be labeled as stray though significant findings, not involving any sincere efforts to reconstruct the depositional history, environment and palaeoecology of the deposits and their fauna. The age assignments to these deposits were vague and tentative. Nor has any effort been made to determine the significance of the fauna in wider perspective of the alluvial deposits of the Ganga and the Yamuna rivers. However, these findings did indicate a humid climate in the area, supporting a rich vegetation which could sustain a diversified and rich fauna during certain times of Late Quaternary.

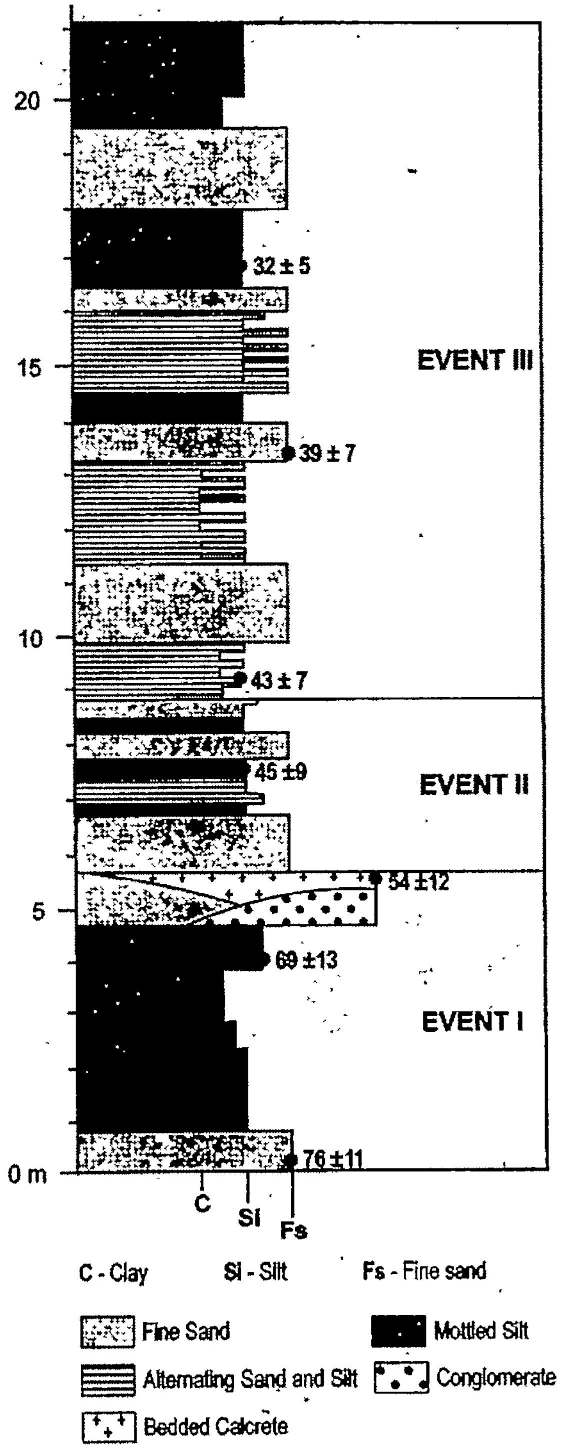

Fig. 2: Schematic vertical lithological succession of Kalpi section. Generalized lithologies based on the field observations are given. Most of the lithologies and beds pinch out laterally on a scale of tens of metres; but the three Events are identifiable along whole of the section. The lithic implements occur in the calcrete conglomerate developed as the contact between Event I and II and rarely in the basal deposits of Event II; while bone implements are present in this conglomerate and in the lower part of the Event II deposits. The position of samples dated by luminescence method are marked, along with their dates. One division of scale = 1 centimetre.

Singh *et al.* (1999), since their first reported discovery of a sizable vertebrate faunal assemblage discovered in 1997 from the Kalpi section (Fig. 2), are working in the area since then with a view to reconstruct depositional processes, palaeoenvironment, and palaeoclimate of this section and put the succession in a chronological framework. During the last five years the concerted efforts of the team have yielded not only numerous fossilized bones but also some small pebble-tools, flakes and chips, as well as a number of bone tools with evidence for partial burning. This assemblage includes an elephant tusk and numerous fossilized bones of bovids, equids and elephants, etc., some of them showing a blackening effect (Singh *et al.* 1999). Apart from the finds from the Kalpi section, approximately one kilometre down stream, some human femur bones with sharpened distal ends were also found from the exposed channel bar of the river, loosened from the deposit by the river action. Realizing the significance of the presence of bones, bearing deliberate human workmanship and blackening effect, Singh *et al.* (1999: 1022-26) surmised human occupation at Kalpi section site. Initially, the chronology of the artefacts and vertebrate fauna bearing horizon (Event II) was based on two radiocarbon dates of calcrete nodules. The calcrete nodules from top of Event I gave an age of >40 kyr (BS – 1322); while calcrete nodules from lower part of Event III gave an age of 28,530 ± 1090 yrs B.P. (BS-1323). The F/P_2O_5 ratio of the bones from Event II indicated age of 20-35 kyr (Late Pleistocene). Thus, the age of Event II was considered around 30 kyr (Singh *et al.* 1999).

Kalpi Section

In the last decade, attempts have been made to understand the Late Quaternary history of the Ganga Plain in terms of its geomorphology, neotectonics, climate change and chronometry (Singh 1996, 2001, 2002; Kumar *et al.* 1996). The southern part of the Ganga Plain, also designated as Marginal Alluvial Plain (Pathak 1982; Bajpai and Gokhale 1986; Singh 1996), exhibits deep entrenchment of the river channels and evidence of neotectonic activity (Misra *et al.* 1994; Agarwal *et al.* 2002). The river cliff section exposes 20-40 m thick successions and offers an opportunity to study the sedimentological evolution of the Late Quaternary deposits in response to climate change, base-level change and tectonic activity of the area. For a detailed sedimentological, palaeoclimate and neotectonic study, the cliff section of Kalpi was selected.

The Kalpi section is located on the southern bank of the Yamuna River, trending NW-SE, about 20 m thick extending over 1 km and divisible into three stratigraphic units, designated informally as Events (Singh *et al.* 1999). The following description of this section is based on Singh *et al.* (1999) and some additional unpublished information.

Event I: It makes up the 5 m thick lower part of the succession composed essentially of reddish to brown-coloured silty sediments, highly mottled with distinct different types of calcretized burrows and scattered calcrete nodules. The top of this event shows lensoid units of calcrete conglomerate. The succession is made up of distinct lithofacies that laterally merge into each other. Event I at most places is capped by a bedded calcrete horizon often showing spongy character, or calcrete conglomerate which in the middle part of the section contain a few centimetre size quartzite pebbles. The quartzite pebbles exhibit rounded edges and corners and many show fresh broken surfaces (human artefacts). At places brown silty sediments of Event I are directly followed by micaceous grey fine sand of Event II without intervening calcrete conglomerate or bedded calcrete horizon. The sediments seem to be derived from a southern cratonic source. Geochemically these sediments indicate a high intensity of weathering. Clay minerals are dominantly smectite, moderate illite and low chlorite and kaolinite. We interpret this data to indicate that the climate was moderate to dry.

Event II: It is about 4 m thick succession of light grey micaceous fine sand. At places, where calcrete is absent between the sediments of Events I and II, load structures and related deformation is evident at the contact where the sediment of Event II has sunk in the sediments of Event I. The sediment of Event II shows evidence of prominent liquefaction throughout the succession producing plastic deformation of laminae, cylindrical nodules of deformed laminae related to water escape vents. This soft sediment deformation is considered to be the result of a seismic event. In one sector the calcrete conglomerate at the contact between Event I and II contains quartzite pebbles, many of them exhibit fresh broken faces. In this band and the succeeding layers, worked bone artefacts are common. The Event II sediment has yielded a 3.54 m long elephant tusk, a 1 m long shoulder blade of elephant, molars of bovids, equids, crocodile, and other vertebrate bones. The quartzite pebbles and large bones seem to be brought by humans. The gentle currents responsible for deposition of fine grained sediments of Event II were not capable of moving such large objects. The succession exhibits an abundance of calcretized burrow systems of a large variety. Nodular calcrete is also present throughout the succession. The sediment seems to be derived from northern Himalayan source, may be partly mixed with southern cratonic source sediments. Geochemically the sediments indicate moderate intensity of weathering, silt fraction is rich in mica, clay minerals are dominantly smectite and illite with little chlorite and kaolinite. We interpret our data to indicate that the climate was humid.

Event III: This is a 10–12 m thick succession of reddish to dark brown sediments consisting of lithounits of clayey silt, fine sand, silt and calcrete conglomerates, all of them showing prominent mottling and a variety of calcretized burrow systems. Nodular calcrete is present throughout the succession. The sediment seems to be derived from a southern cratonic source. Geochemically the sediments indicate high intensity of weathering in the lower part, moderate to low intensity in the upper part. Silt fraction is poor in mica. Clay minerals exhibit high smectite in the lower part, decreasing in the upper part with a corresponding increase in illite. Content of chlorite and kaolinite is low. We interpret the data to indicate that the climate was humid in lower part with increasingly dry climate in upper part.

More recently the Kalpi succession has been dated by luminescence method using Infrared Stimulated Luminescence (IRSL) technique. A total of seven samples were collected in steel tubes along the exposed cliff section in 1998 and dated at the Physical Research Laboratory, Ahmedabad. In view of the fine-grained nature of the samples the dating analysis was done using IRSL from polymineralic fine grains in the size range of 4-11 mm. Details of the analytical technique and use of various doses are not given here and shall be discussed elsewhere. Here only the estimated IRSL ages of different samples of the Kalpi section are given. The basal part of Event I gives an age of 76 ± 11 kyr while top of Event I is 54 ± 12 kyr. The basal part of Event II is 45 ± 9 kyr. The basal part of Event III is 43 ± 7 kyr. It is logical to infer that artefact yielding basal Event II is about 45 kyr in age. General lithology, three depositional events and the luminescence ages are depicted in Fig. 2.

Luminescence dates of Kalpi section have been preferred over the earlier ^{14}C dates because first, the time frame of the deposit fall near the lower limit of ^{14}C-dating technique, second the ^{14}C dating was done on calcrete nodules which have some inherent problems, third seven TL dates are available in the section giving stratigraphically consistent ages.

It may be pointed out that the stone tool assemblage and the bone implements are so far recovered from the basal and middle parts of the Event II deposits. The stone tools have been recovered from a limited area of about 50 m lateral extent. On the contrary, the bone implements are recorded from a fairly large area of a few hundred metres. The stratigraphic horizon containing this tool assemblage is dated about 45,000 yrs B.P., which makes it a Middle Palaeolithic industry.

Tool Assemblage

A reasonable number of lithic and bone tools have been collected between March 1997 and June 2002.

Lithic assemblage

A study of this material shows that the artefacts are mostly made on quartzite. Most of the flakes and chips also appear to be detached from quartzite pebbles. However, a few flakes of chert also occur. The assemblage includes pebble-tools (Fig. 3a), cores, un-retouched pebbles, broken pebbles, atypical points, one scraper, and chips (Table 1). Excluding the chips the pebble element is about 79.4% of the assemblage. All the unifacial and bifacial tools are made on quartzite.

Table 1: Details of the lithic assemblage of Kalpi section

S.No.	Stone artefacts and other material	number	percentage
1.	Pebble-tools		
(1)	Unifacial	7	10.77
(2)	Bifacial	4	6.15
(3)	Other	1	1.54
2.	Pebbles – broken	8	12.31
3.	Core	3	4.62
4.	Flake-tools		
(1)	Typical	1	1.54
(2)	Atypical	5	7.69
5.	Chips	31	47.69
6.	Pebbles (Un-retouched)	5	7.69
	Total	65	100.00

Out of twelve pebble-tools eleven are roughly round based and only one is concave based. Most of the tools have concave or convex working edge. One specimen of plano-convex and another of straight working edge are also present. The edge-wise and base-wise details of the tools are given in Table 2. Unifacial tools with convex working edge appear as most preferred type. Some of them are worked in a manner that they exhibit an angular working edge. One of them shows a denticulate concave working edge, while another one is consisting of a denticulate convex working edge. Bifacial tools bear concave or convex working edge. One example of this type shows an angular edge. Besides, working edge of an artefact is wavy. Un-retouched pebbles, besides some broken ones, are

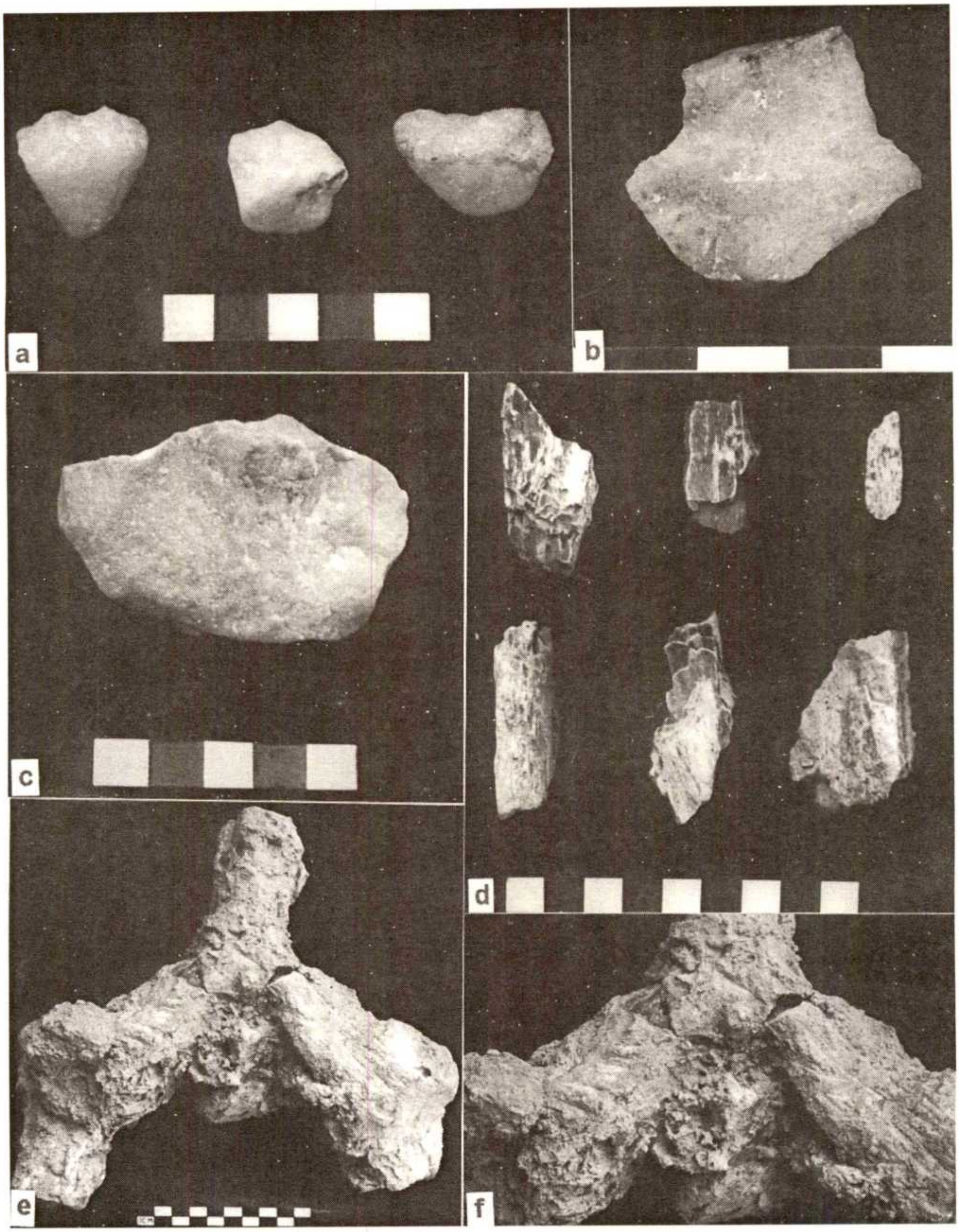

Fig. 3: Implements found in Event II of the Kalpi section, Yamuna Valley, District Jalaun. (a) Unifacial pebble tools; (b) Side scraper on a fine grained quartzite flake; (c) Quartzite flake core; (d) Bone pieces, ashy in colour, most probably due to burning; (e) A fossilised cervical vertebra of a large mammal like an elephant bearing millimetre deep cut marks, probably used as an anvil; (f) Close up of the cut marks on the above mentioned mammal vertebra.

present in a considerable proportion. Special mention may be made of a pebble specimen with a deliberately made tang on one end while the other end remains unworked. It is unique in the sense that it does not resemble any of the known pebble artefacts recorded anywhere (Fig. 5d).

Table 2: Details of the pebble tools, Kalpi section

S. No.	Tool type	Concave based	Round based	Total
1.	Concave working edge	–	2	2
2.	Convex working edge	–	7	7
3.	Straighto-convex	–	1	1
4.	Straight working edge	1	–	1
5.	Tanged	–	1	1
	Total	1	11	12

Measurement wise details of the pebble-tools/pebbles and cores are given in Table 3. Most of the pebble-tools are measurable between 2.0 and 4.0 cm (length), and 2.0 and 3.0 cm (width). The smallest tools are measured about 1.0–1.9 cm in length, having width of almost the same size. Two of the largest tools are 4.5 cm long.

Table 3: Measurements of pebbles/ pebble tools and cores, Kalpi section

Size Range in mm	Length		Width	
	No.	%	No.	%
40-50	2	10.53	0	0
30-39	3	15.79	0	0
20-29	10	52.64	16	84.21
10-19	4	21.05	3	15.79
00-09	0	0	0	0
Total	19	100.00	19	100.00

A concave side-scraper on a flake of fine-grained quartzite is notable (Fig. 3b). The concave working edge has micro-denticulation. Five un-retouched small flakes contain borer like point, though not made deliberately. A flake-core of quartzite measuring about 7.0 x 4.4 cm is also notable (Fig. 3c). It bears several negative flake scars on both the surfaces, with striking platform on either larger side. Details of the size ranges of flake-tools are given in Table 4.

Table 4: Measurements of flake tools, Kalpi section (in mm)

Size Range in mm	Length		Width	
	No.	%	No.	%
30-39	1	16.67	1	16.67
20-29	2	33.33	0	00.00
10-19	3	50.00	5	83.33
00-09	0	0	0	0
Total	06	100.00	06	100.00

Bone implements

As mentioned earlier, a sizeable number of fossilised bones including those showing definite evidence for human activity, have been reported from the Event II. A considerable proportion of them apparently appears charred in varying degrees. Some of the bone pieces have become ashy in colour, most probably due to burning (Fig. 3d). The most important feature, which needs to be elaborated here, is the presence of several bones bearing cut-marks and worked edges. Their typological screening is given below in Table 5. No doubt that a good number of them may be included in the category of bone implements. The bigger bones with cut-marks might have served as anvil.

Table 5: Details of the bone artefacts of Kalpi section

S.No.	Artefacts	number	percentage
1.	End-scraper	2	8.70
2.	Point	8	34.79
3.	Notched implement	2	8.70
4.	Burin	7	30. 43
5.	Bone showing cut mark	3	13.04
6.	Atypical end scraper	1	4.34
	Total	23	100.00

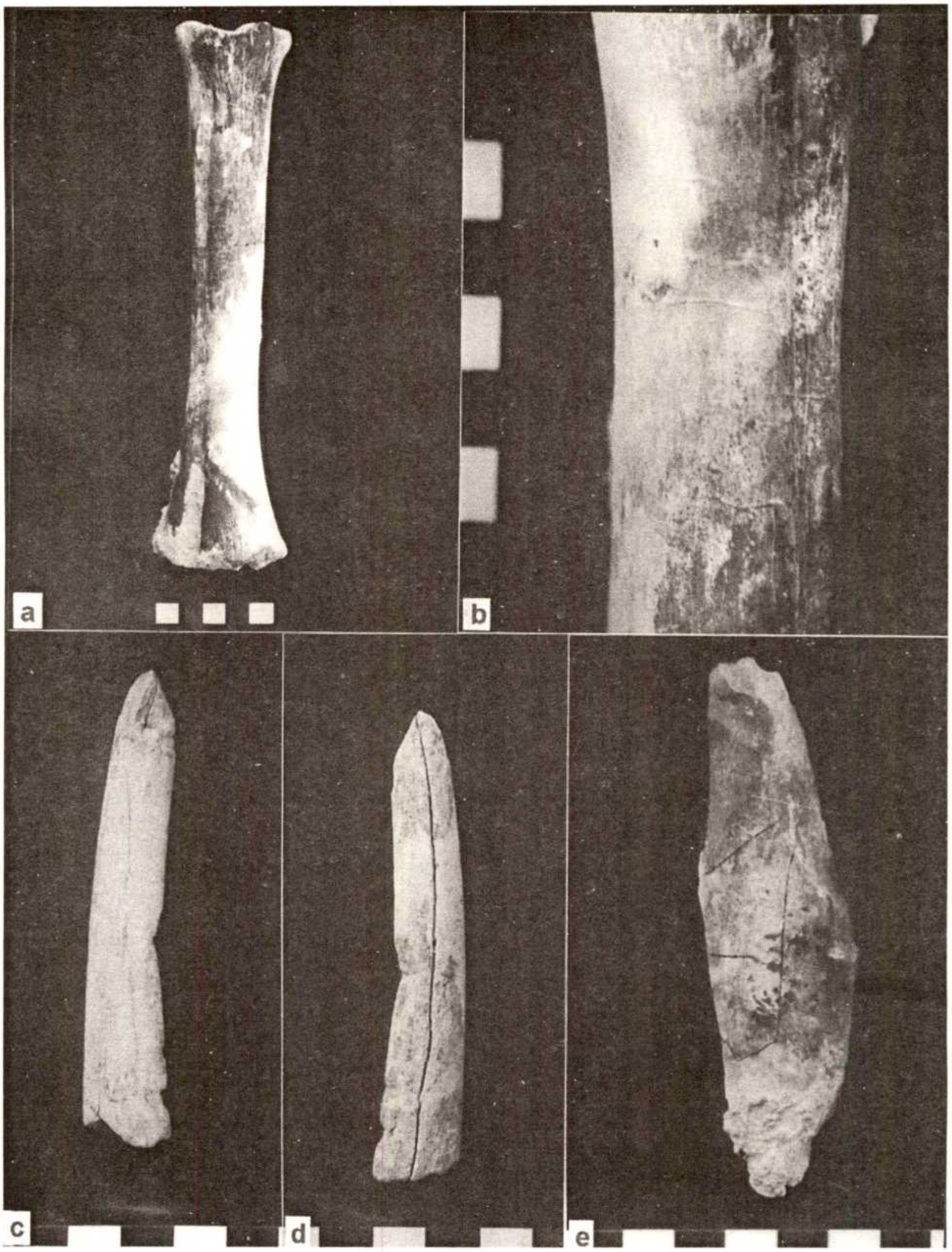

Fig. 4: Implements found in Event II of the Kalpi section, Yamuna Valley, District Jalaun. (a) A charred metatarsal bone of *Bos* sp. bearing shallow cut marks; (b) Close up of the cut marks on the above mentioned bone; (c, d) An artefact made on an uncharred bone with a point on distal end and three notches, two small and one large, on one of the two sides. The notches apparently appear to be deliberately made for fastening this artefact with a shaft, obverse and reverse views; (e) An end scraper on an elongated bone showing high angle retouching on the distal end.

A fossilized cervical vertebra of a large mammal like an elephant is notable amongst the above finds which bears a few millimetre deep cut marks on its upper surface. A layer of calcrete is still sticking on its surface all over. The cut marks are very prominent and are more or less parallel to each other. It appears that these marks were formed by some sharp edged tool used for cutting or butchering something placed over it, indicating thereby that it served the purpose of an anvil. Measurement of this anvil is about 23.00 x 23.5 cm (Figs. 3e-f).

A charred long bone having 22.2 cm length and 2.5-5.5 cm width, a metatarsal bone of *Bos* sp., also bears shallow cut marks. Three of them are parallel to each other (Figs. 4a-b).

A broken large piece of fossilized and charred bone measuring about 18 x 8 cm is significant on account of grinding on two surfaces which meet at a right angle. Its usage is not clear.

Bone artefacts are generally made on elongated pieces of bones of various sizes split vertically from the long bones. Amongst them, points are maximum (34.78%). Most of these tools often bear deliberately marked deep to shallow flaking scars to make a pointed tip or working edge on one end. It appears that the selection of bones of different sizes (Table 6) was intentional to make implements for different purposes.

Table 6: Measurements of bone-tools, Kalpi section (in cm)

Artefacts	S. No.	Length	Width
Point	1.	3.6	1.4
	2.	5.5	1.8
	3.	14.3	4.2
	4.	3.9	1.4
	5.	8.1	2.5
	6.	4.6	2.2
	7.	2.5	1.9
	8.	12.0	3.2
Burin	9.	6.0	2.4
	10.	6.0	2.4
	11.	11.0	3.8
	12.	8.8	3.2
	13.	11.5	3.8
	14.	3.7	1.0
	15.	5.8	1.9
End-scraper	16.	6.3	1.3
	17.	10.3	3.0
Notched tool	18.	4.4	1.9
	19.	9.0	1.8
Atypical End scraper	20.	03.8	03.0

Amongst the two notched tools, the larger one, measuring 9.0 cm (length), 1.1-1.5 cm (width), is an uncharred bone with a point on distal end and three notches, two small and one large, on one of the two sides (Figs. 4c-d). The notches apparently appear to be deliberately made for fastening this artefact with a shaft, most probably wooden.

End-scrapers form about 13% of the assemblage. Out of three, two are typical end-scrapers, made on elongated split bones. Their distal end bears high angle retouching from dorsal to ventral surface (Fig. 4e).

A piece of bone, measuring 10.8 x 3.8 cm, is detached from a long bone (Fig. 5a). It appears partly charred. It is a single stroke axial burin.

One of the points (Figs. 5b-c), measuring 3.9 cm (length) x 1.4 cm (width) x 0.6 cm (thickness), needs special mention. It is roughly triangular in shape. Its upper surface is flattened and comparatively smoothened. The point is formed by bifacial retouch. Whole of the artefact bears blackening effect of the pre-working stage. About 0.4 cm portion of its point is once again fire-hardened after the completion of the retouching.

The length and breadth of the burins, represented by 30.43 % tools of the Kalpi collection, show that they are made on blade like elongated bone pieces. Almost all of them are axial burins having their working edges on distal ends (Fig. 5e, illustrated on left and right sides). The upper surface of the right one is ground.

Another notable bone artefact is about 14.5 cm long and 4.2 cm broad (Fig. 5f). It is made on a piece of a large bone, which is also charred. Its upper right side is denticulated, and the distal end is pointed.

Table 7: Size ranges of the bone artefacts, Kalpi section (in cm)

Size Range	Length		Width	
	No.	%	No.	%
14.0 – 16.0	1	5	–	–
12.0 – 13.9	1	5	–	–
10.0 – 11.9	3	15	–	–
8.0 – 10.9	3	15	–	–
6.0 – 7.9	3	15	–	–
4.0 – 5.9	4	20	1	5
2.0 – 3.9	5	25	9	45
0.0 – 2.9	0	–	10	50
Total	20	100	20	100

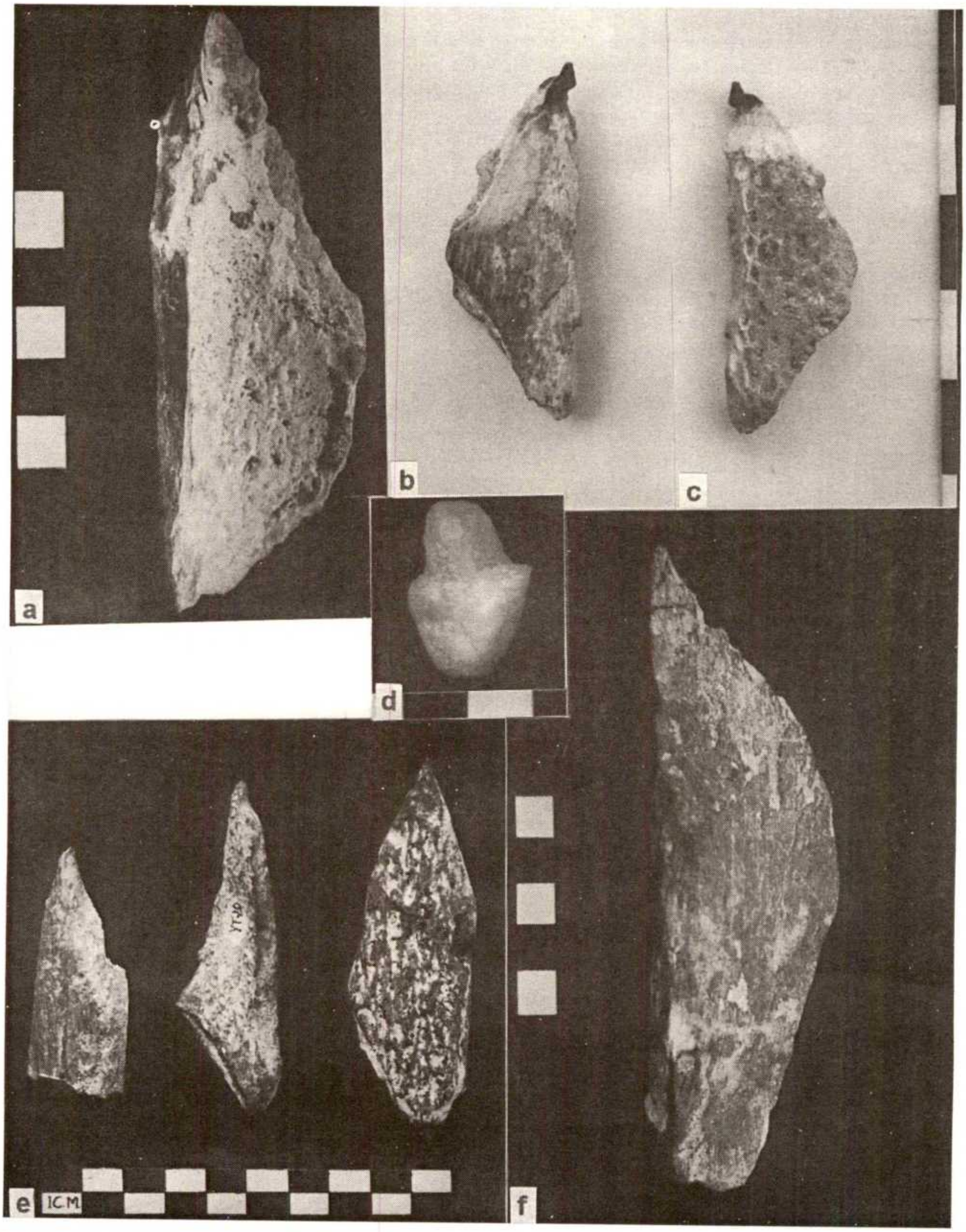

Fig. 5: Implements found in Event II of the Kalpi section, Yamuna Valley, District Jalaun. (a) Single stroke axial burin on a charred piece of bone; (b, c) Bone point showing bifacial retouch and fire hardened point, obverse and reverse views; (d) A pebble specimen with a deliberately made tang on one end while the other end remains unretouched; (e) Axial burins (illustrated on the left and right sides) on charred bone pieces; middle one is point on a charred bone with a serrated edge; (f) An artefact made on a piece of charred bone having denticulate upper side and pointed distal end.

A bone belonging to the *Bos* species needs special mention here, because it might have been used as a hammer. At the mid shaft the cortex of the bone is chipped off at regular intervals, due to which the medullary cavity is exposed. 'This appears to be like sharpening a pencil. The breakage at the distal portion is recent' (personal communication from P.K. Thomas).

Discussion

Though the faunal remains, as mentioned above, have been found from time to time from different places along the axial rivers, the Yamuna and the Ganga, yet any type of human association with these fossil finds could not be conclusively established at any of the sites. However, the recent investigations of Kalpi section along the Yamuna River records for the first time, the occurrence of a variety of vertebrate fauna along with the evidence for human occupation in the Event II, assignable to Late Pleistocene. The presence of worked angular pebbles, other stone artefacts, charred bones, bone artefacts and bones bearing cut-marks amply testify to human activities in Kalpi area for the first time. It may also be recalled here that Capt. Smith had also recorded the presence of angular pebbles along with the faunal remains from Karimkhan in Yamuna valley in 1833, but it was not possible for him to identify the evidence for human workmanship on pebbles and bones, if any, in the earlier part of nineteenth century.

In view of the typological and also chronological considerations, the stone and bone industries of Kalpi may be placed in the Middle Palaeolithic. It needs to be recalled, however, that prior to the finding of the Kalpi industries, sporadic occurrence of some stone artefacts, supposedly belonging to the Lower and Middle Palaeolithic phases had been reported earlier from a few sites located in the alluvial plains of Uttar Pradesh. Among them, mention may be made of the Yamuna section at Mau, District Banda (Present Chitrakoot) (IAR 1968-69: 34), Bahadarabad near Haridwar (Sharma 1985:37). It is also important to mention here that a site named Lahchura, located at the tri-junction of Hamirpur and Jhansi districts of U.P. and Chhatarpur District of Madhya Pradesh is the nearest site in Vindhyan hills, which has yielded both Lower and Middle Palaeolithic industries from the surface along the river Dhasan (Pant 1982: 39-49, 72-6). However the label - 'Palaeolithic' applied to the above industries is primarily based on typological considerations alone.

Both Lower and Middle Palaeolithic industries of Lahchura are primarily pebble-tool industries, and comparable with the lithic assemblage of Kalpi. But the similarity between the two can hardly be stretched further, since the average size of pebble tools of Lahchura is three to four times larger than that of Kalpi. Recent reinvestigation at Lahchura, yielded some small quartzite pebble-tools, similar to those found at Kalpi, also along with the bigger quartzite pebble-tools already reported earlier (unpublished data, Tewari). However, in the absence of definite stratigraphy, it is difficult to ascertain whether these small pebble implements form an integral part of any of the two pebble-tool industries of Lahchura described by Pant (1982).

The size range of the lithic artefacts of Kalpi reminds us about the stone industry of Verteszollos in Hungary, which comprise more than 3000 tools and flakes, but no handaxes. Nearly all the tools are fabricated from pebbles. The implements especially those of quartz and flint – are very small averaging only 2.5 cm in length. The miniature tools also include typical choppers and chopping tools, besides the various other types like very small scrapers, denticulated tools, notched scrapers, some end scrapers, and borers. Burnt bones are found along with them as is the case with Kalpi section. Similar site comprising small pebble-tools is also known from Budapest (Bordes 1968: 89-92). Though the Verteszollos industry is said to belong to the Lower Palaeolithic period the size range of the tools surprisingly compares well with that of the Kalpi collection.

To the best of our knowledge, a bone industry, similar to the one found at Kalpi, and belonging to the Middle Palaeolithic, has not been reported from anywhere else in the Indian Subcontinent. A somewhat comparable bone industry was excavated by Murty from the caves of Billa Surgam, near Beta Machrela, District Kurnool, Andhra Pradesh. The TL dates indicate a time range of about 30,000 to 10,000 yrs B.P. (Murty 1985: 19; 1989: 33-5). Thus, the time range differs widely between the two and bone tool industry at Kalpi is definitely much older. Murty (1985: 18; 1989: 35) has reported 'some of the bone blanks removed from angulate phalanges having fire hardened tips', from the cave site of Muchchatla Chintamanu Gavi. This type of burnt and blackened bone-points and bone arrowheads has been recovered in the archaeological excavations carried out at other sites of the country also, though in a considerably late chronological context namely Neolithic-Chalcolithic (Sharma 1991: 105; Singh 1994: 180). Several bone specimens of Kalpi bear marks of fire-hardening, and thus the site may be credited with preserving the evidence for the earliest use of this technique in the Indian Subcontinent.

As far as the human bones with pencil sharpening feature are concerned (Singh *et al.* 1999), it is notable that these bones have been collected from the exposed channel-bar of the Yamuna river. Moreover, comparable human bones have not been recovered from Kalpi section. Therefore, as long as the human bones are not found in the stratigraphic context it would not be appropriate to associate those with the faunal remains and artefacts recovered from the sediments of the Event II of Kalpi section.

The rich vertebrate fauna of Kalpi section would demand a much more humid climate in the area than today. Record of rich vertebrate fauna only few kilometres upstream of Kalpi, near Daulatpur, Kanpur Dehat, which includes elephant, equids, bovids, hippopotamids, cervides, camels, gavials and chelonians (Mishra 2001) also indicates a humid climate. This horizon is in all probability equivalent to the Event II of Kalpi section. Geochemical and mineralogical studies of sediment samples from Event II suggest a humid climate (unpublished data).

As discussed earlier, a number of horizons of vertebrate fossils are recorded from time to time in different parts of Ganga-Yamuna river sections and in the subsurface, extending from Kalpi in Uttar Pradesh to Bhagalpur in Bihar, and have been assigned Early to Late Pleistocene age on tentative grounds. The faunal rich Event II of Kalpi section has been now dated as 45 kyr. It seems likely that at least some of the vertebrate fauna occurrences in Ganga Yamuna river valleys represent humid climate event of 40-45 kyr. However, it is also possible that these vertebrate fossil horizons belong to more than one depositional events during the Late Pleistocene. Study of these vertebrate fauna rich horizons may be useful in reconstruction of climate history and human occupation pattern in the Ganga Plain.

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Geomorphological Contexts of the Stone Age Record of the Ganol and Rongram Valleys in Garo Hills, Meghalaya

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Abstract

This paper discusses the geological context of the stone tool assemblages of the Ganol and Rongram valleys in Garo Hills, Meghalaya. The research included intensive stratigraphic studies of the Ganol and Rongram valley alluvium to establish a chronological background for the cultural material recovered from these alluvium. The cultural material consists of a flake-blade assemblage, a pebble-tool assemblage, a bifacial tool assemblage and the ground and polished tool assemblage. The paper presents a discussion on site preservation, site setting and stone tool assemblages from the area.

Introduction

Prehistoric tools were first reported from Garo Hills in 1931 by Walker and systematic studies were undertaken later by various workers (Dani 1960; Goswami and Bhagwati 1959; Sharma 1966, 1967, 1970, 1971, 1979; Rao 1970; Mahanta 1995). A number of chronlogies have been proposed, based on artefact typology without corroboration by the context. Most of the sites have been often referred to as surface sites and the data have been analyzed overlooking the limitations of a surface data. Site formation processes that might have acted on the assemblages have completely been ignored. The settlement pattern that might have affected the distribution of sites has also not been studied. Thus, though the typological inventory of the tool assemblage is quite rich, the ages assigned to each type have been a topic of controversy.

To resolve this controversy an attempt has been made to establish the geo-stratigraphic context of the lithic assemblages. This has also provided clues to the palaeoclimate of the region that has indirectly helped in the reconstruction of the lifeways of the prehistoric inhabitants of the area. The main objective is to develop a regional archaeological structure so that the indigenous developments in the area can be understood.

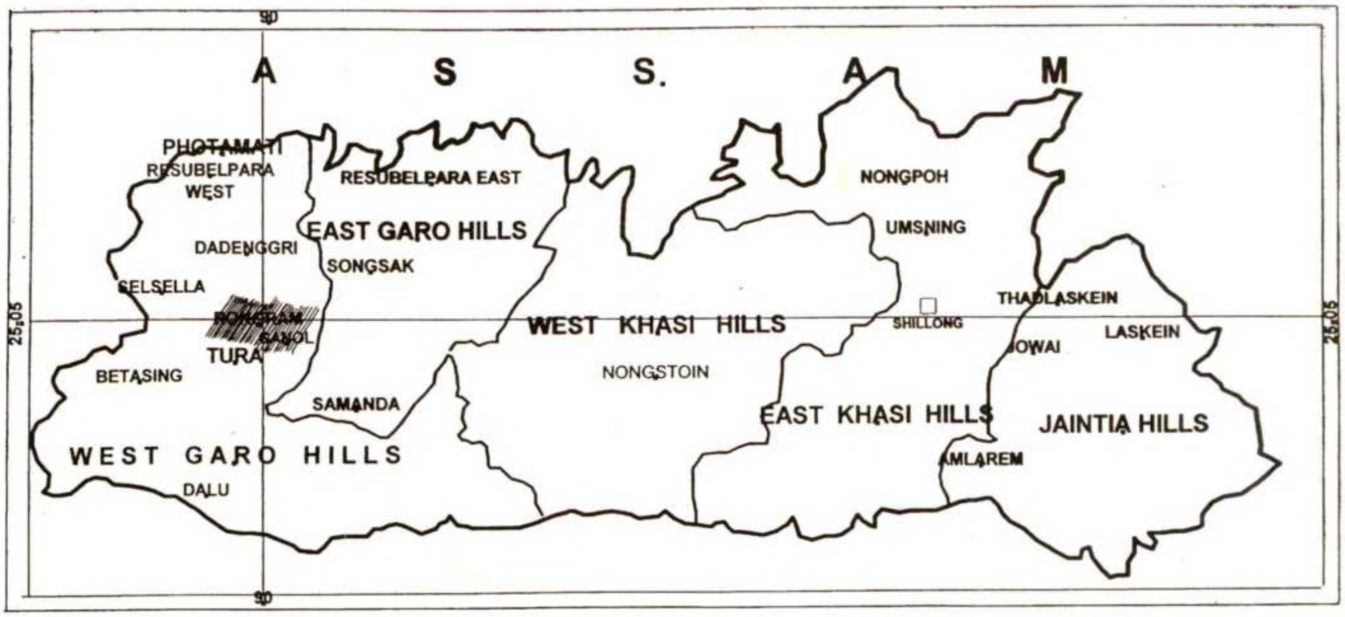

Fig. 1: Map of Meghalaya

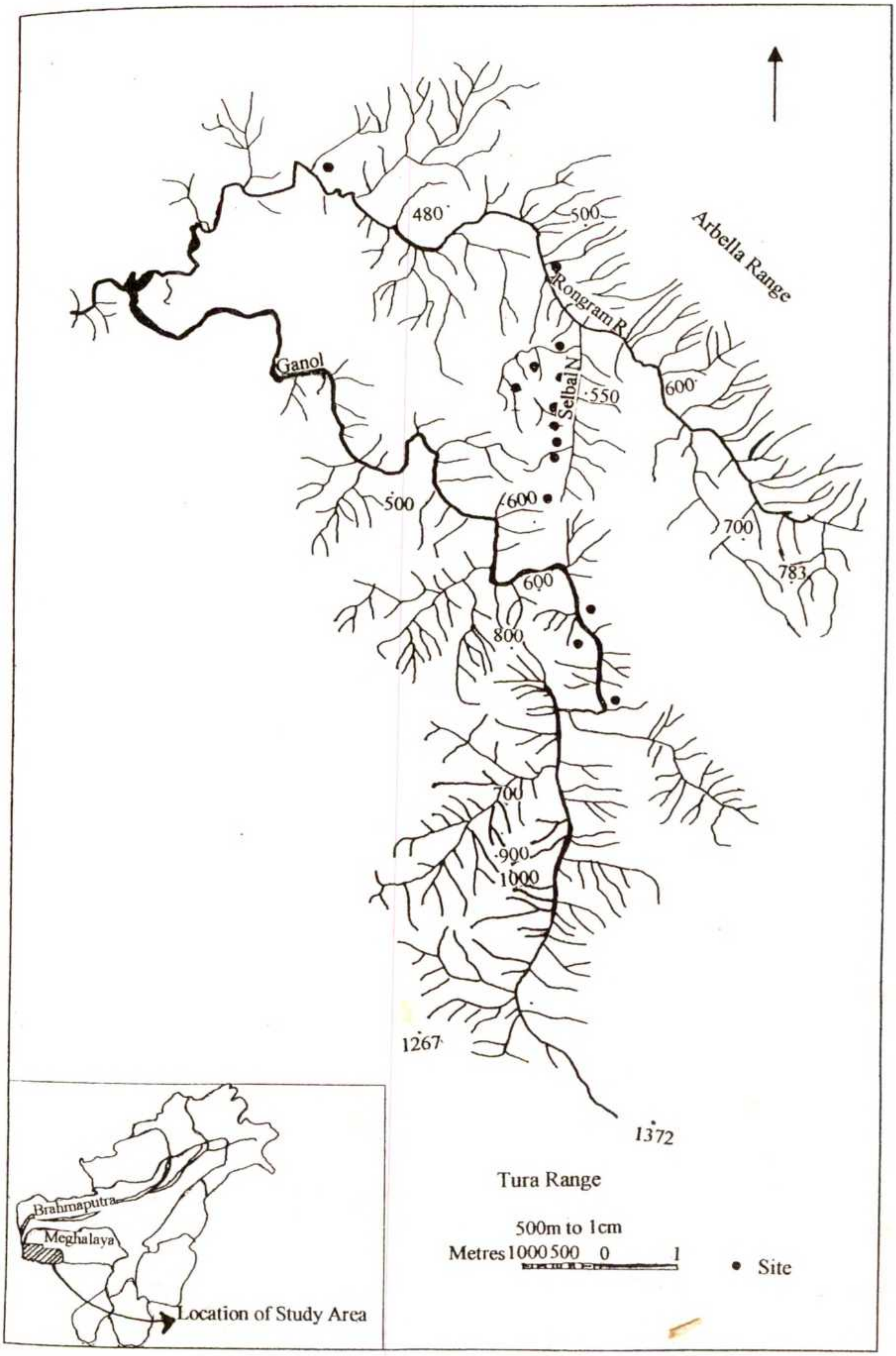

Fig. 2: Drainage map

Environmental Background

The Ganol and Rongram valleys are located on the western side of the Garo Hills District of Meghalaya in northeast India (Fig. 1). The greater part of the district consists of hills and Nokrek, the highest peak of the Tura range is 1412 m AMSL. About 8 km north of the Tura range, there is a much shorter chain of hills, known as the Arbela range whose highest peak is 983 m AMSL. The Tura and the Arbela ranges lie almost parallel to one another, east and west near the centre of the district. The study area consists of the upper and middle portions of the courses of these two rivers lying between the two hill ranges (Fig. 2). A number of first order and second order streams, the average length of which are one to two kilometres, join the Rongram. They are seasonal with permanent water in certain stretches. Streams show control by bedrock structures. The drainage is dendritic (Fig. 2).

The region has a tropical climate and experiences heavy monsoon rainfall of approximately 1000 mm. The average summer temperature is 25 °C while the average winter temperature is 10 °C.

Species of 35 mammals, 426 birds, 62 reptiles, 14 amphibians and 62 fish have been recorded (Ghosh 1984). The area has a rich vegetation due to its varied topography, climate and soil. Three types of forest, (i) Tropical evergreen (ii) Tropical deciduous and (iii) Savanna grassland occur in the region.

Geology

Meghalaya is made up of a block of pre-Cambrian Indian peninsular shield, uplifted to its present height of about 600-800 m AMSL. The Shillong peak, the highest peak of the plateau is 1951 m AMSL. The various geological formations are: (a) Archaean Gneissic complex with acid and basic intrusives; (b) Shillong group of rocks; (c) Lower Gondawana rocks; (d) Sylhet Trap and (e) Cretaceous sediments.

The Garo Hills, being an integral part of Shillong Plateau, comprise a wide variety of rock types formed from the Archaean to Quaternary period. The rocks of Garo hills have been severely affected by tectonics resulting in monoclines and faults. Large-scale stream migration, deranged drainage and rectilinear stream courses are some of the important geomorphological evidence of neo tectonic activity in the area. (Sinha *et al.* 1983).

The area under study falls in the West Garo Hills District. The oldest rocks found in the area belong to the Archaean gneissic complex whose age is estimated to be about 3600 myr. The gneisses intruded by granitods and younger intrusives formed the basement over which the sediments of Gondawana and Tertiary sediments were deposited. A number of undecomposed dykes of doleritic and basaltic composition intrude the gneisses in the form of sills and dykes. They are usually thin and many are less than 5 m wide.

The Gondawana sediments date to around 350 myr. The Tura sandstone member lies unconformably over or in juxtaposition with the faulted contacts with basement gneissises and marks the onset of Tertiary sedimentation in the area. It is composed of clasts of sandstone, feldspar, shale, and clay in the matrix of feldspathic sandstone. This formation has been dated to about 65 myr. Conglomerates overlie the Tura sandstone member in the study area. Two distinct formations of conglomerates have been marked. They are Boldamgiri formation and Chengapara formation. In the study area the conglomerate is composed of poorly cemented loose, fine micaceous sandstone, siltstone, mudstone and clay. But in the Rongram IB section a ferricretised section of this formation is visible. A Quaternary alluvial fill overlies this deposit. The alluvium is of two types. The recent or the younger alluvium is yellowish brown in colour while the older one is reddish brown. The thickness of the alluvium varies from 2 to 10 m.

Stone tools, the only evidence of the prehistoric occupation of the area occur within the alluvial deposit whose average thickness varies between 1 and 10 m. At the Rongram IB site 3 m of bedrock is exposed below 7 m of alluviam. The deposits are dissected by tributaries of the Ganol, and numerous first and second order streams (Fig. 3 and 4). The deposition of this large amount of alluvium in the upper and middle courses of the river is unusual. This extremely fertile alluvial deposit seems to be one of the prime factors that influenced people to select this area for habitation.

Origin and Formation of the Quaternary Deposits

The Quaternary formations in the study area consist of the older and younger alluvium. Coulson (1942), described the outcrops of Older Alluvium from the parts of Brahmaputra valley as 'Red Bank' which is an apt term for the highly oxidized ochreous formation. The sediments within which

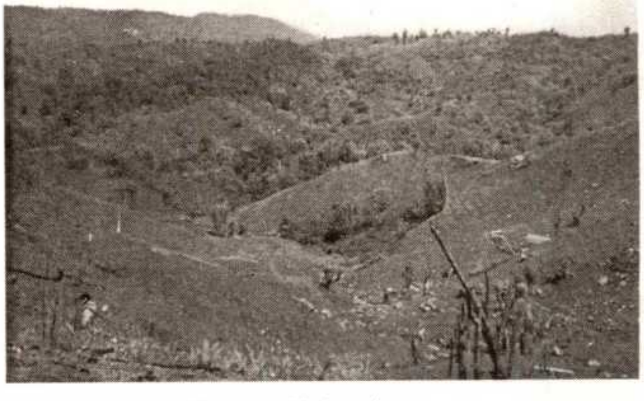

Fig. 3: The valley filled up with deposits

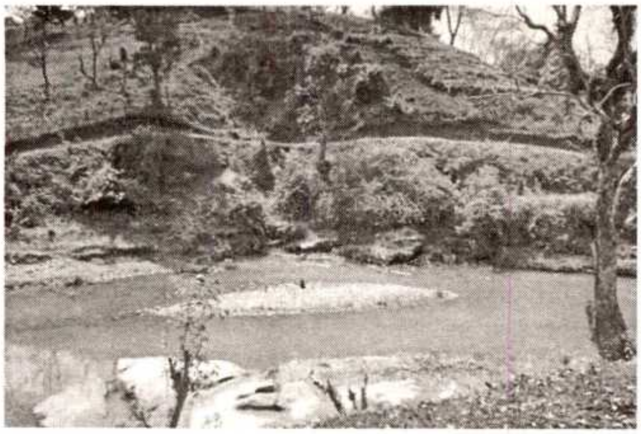

Fig. 4: A rounded top low hillock

the lithic tools are found contain a very high proportion of coarse angular sand and silt. Samples collected from three sites located at different altitudes reveal certain patterns (Table 1). The sediments contain fine angular gravel which suggests that the sediments have not been transported for a long distance. The percentage of clay is negligible, not exceeding 7%. At Rongram IB (484 m AMSL) site and at Gawak Abri (550 m AMSL) an upward fining sequence is noticed. The percentage of silt is comparatively higher in the top layers (Unit 2 Rongram IB-42.53% and Gawak Abri-40.7%) while the percentage of sand is very high at the lower levels (Unit 1 RongramIB-63.59% and Gawak Abri-68.84%). Silt (25% to 30%) is also present at Didami, which is at an altitude of 916 m AMSL. Analysis of sediments from recent river deposits in the area shows the presence of a high percentage (61.94%) of coarse sand.

The coarse character suggests that there has been no sorting of the material. In the samples below 550-600 m AMSL some amount of upward fining sequence is noticed but above it no such situation exists. These deposits appear to be derived from as mass wasting, gravity or debris flow materials and products of soil creep from the Arbella and Tura mountain ranges rather than fluvial deposition. This can thus be called colluvial silt (Fig. 7).

Colluvium includes coarse, unsorted talus and landslide or slump debris on steep slopes below cliffs, and texturally variable, bedded sediments mantling footslopes. The definition embraces deposits transported by mass movement rather than sediments deposited by running water (Botha and Patridge 2000). Such colluviation during the Late Pleistocene has been reported recently from South Africa (Botha and Patridge 2000) and Nepal (Corvinus 1994). Similar formations were observed in Thailand. In the Imphal Valley, Manipur, these deposits, dating between 25-11 kyr, disconformably cap fluvio-lacustrine formations (Thokchom 1987) while similar deposits were reported from the Garo Hills by Medhi (1981). The term alluvium was used in this study initially to define these deposits, but it is proposed that colluvial silt is a better term for the sediments in the upper reaches, while deposits below 550

Table 1: Results of the mechanical analysis of sediments by pipette method

Site name and context	Altitude above sea level (m)	% clay	% total silt	% coarse silt	% medium silt	% fine silt	% coarse sand	% fine sand
Rongram IB Layer I	458	6.27	42.52	27.82	1.12	13.57	27.83	23.36
RongramIB Layer II		5.75	30.65	22.27	4.40	3.97	26.73	36.87
Gawak Abri Layer I	550	10.07	40.70	24.82	9.30	6.58	30.60	18.66
Gawak Abri Layer II		0.62	30.52	26.70	3.35	0.47	33.50	35.35
Didami 2m	916	0.97	29.03	16.20	5.33	7.50	34.57	35.43
Didami 4m		7.95	26.48	10.93	15.08	0.44	38.40	27.18
Selbal Chiring Modern Terrace	550	2.43	18.43	5.55	6.65	6.23	61.94	17.21

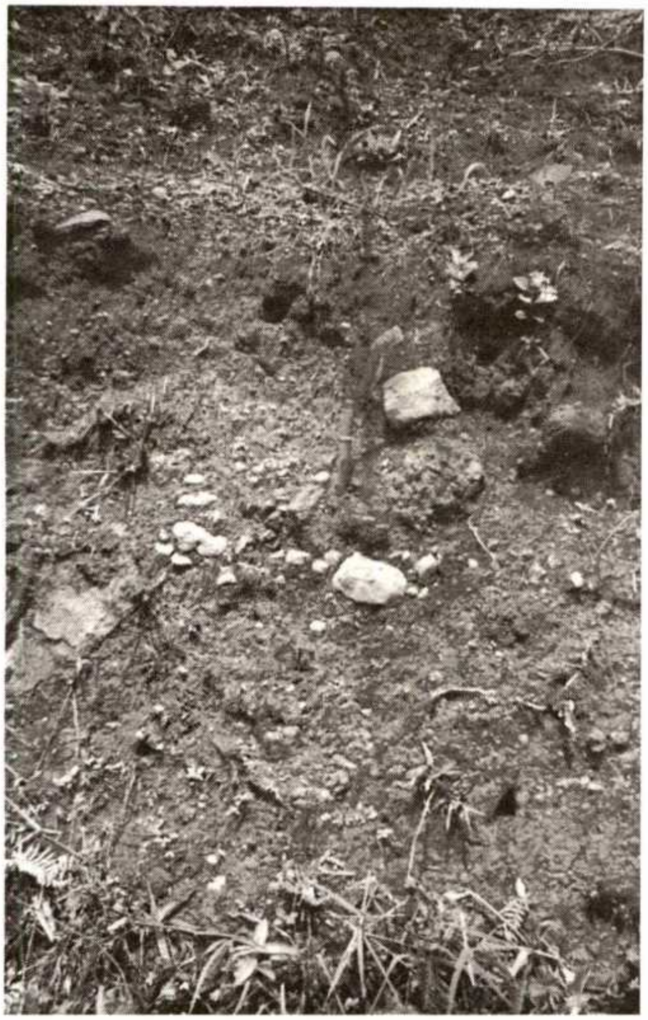

Fig. 5: Colluvial silt

m AMSL can be called sandy silt or silty sand and pure alluvium is present in the confluence of the Ganol and the Rongram, which is outside the study area. In the Rongram IB site some alluviation has occurred for which the yellowish brown younger alluvium and the strong brown older alluvium is distinctly visible.

The location of the sites shown in the map (Fig. 2) clearly indicates that prehistoric people had chosen the alluvial/colluvial mounds in between the right bank of Ganol river and left bank of Rongram river specifically where the slope is comparatively gentle. On the left bank of the Ganol river no site is recorded while on the right bank of the Rongram river only three sites are recorded. This selection made by the prehistoric inhabitants is noteworthy. The depressed trough or basin in between the Tura and Arbella ranges is enclosed on three sides by steep slopes and dense vegetation. There is a narrow opening on the western side through which the rivers flow out of the basin. This enclosure provides a natural boundary that protects the basin from strong winds and heavy clouds that blow from the south, southwest and southeast and north and northeast. The luxuriant growth in the hill slopes is the home of a large number of edible plants and animals. Organic raw material like bamboo, cane and wood used as construction material and for making tools are found in abundance besides dolerite dyke material for making lithic tools. Also the slopes can be used for shifting cultivation. The height of the majority of the deposits is much above the flood level. Also a few of them have formed when a flood plain is abandoned through valley incision, thereby isolating the surface from flooding. This provided a dry dwelling surface.

Northeast India has been profoundly influenced by the uplift of the Himalayas and climatic oscillations. In parts of north and northeast India, the Quaternary fluvial, fluvio-lacustrine, lacustrine, fluvio-glacial and glacial sediments are broadly related to the three cycles of sedimentation. The first cycle of sedimentation formed part of the late Neogene sedimentation in the Siwalik Basin or the foredeep that continued into the Lower Pleistocene. It terminated with the last phase of the Himalayan orogeny (HO-4) during the Early Middle Pleistocene. The second cycle was initiated in the Middle Pleistocene in the Indo-Gangetic and Brahmaputra basins of the sub-Himalayan and Arakan Youma Mountains and terminated in the Upper Pleistocene. It continued in some smaller basins/lakes. The third cycle commenced at the beginning of the Holocene and is still continuing. In the Brahmaputra valley and adjacent valleys in parts of Assam, Arunachal Pradesh and Meghalaya fringe areas, generally four terraces have been mapped. The fluvial terrace deposit (T1), which is dissected, highly oxidized orange to dark brown colour, and mapped in the southeastern most corner of Assam, along Tipang nala has given an age of 38,020 ± 2,230 bp (BS-573), at Singra, 32,540 ± 1130 bp (BS-746) in Lakhimpur District on the northern bank of Brahmaputra (Ramesh and Rajgopalan 1999).

On the northern fringe of the Meghalaya Plateau, the Quaternary sediments lie directly on the eroded basement of the pre-Cambrian rocks.

Morphostratigraphic mapping of about 1500 km^2 area in the lower Brahmaputra valley fringing the northern slopes of the Meghalaya Plateau, in close proximity of the study area has distinctly brought out four Quaternary morphostratigraphic units and a pre-Cambrian rocky unit. The Quaternary evolved through four distinct phases of fluvial sedimentation punctuated by degradational (erosional) breaks. There is a definite indication of break in the continuity of the Pleistocene sedimentation possibly due to base level lowering (i.e. eustatic causes). This evidence was collected from the Phutamati area in North Garo Hills (Fig. 1), bordering the northern slopes of Meghalaya Plateau where partial erosion of the surface indicates a break. A subsequent rise in the base level must have caused the deposition of the Chibimang Formation, a phase which just preceded the Holocene which seems to be short lived, as suggested by the minor thickness of this formation. During the Holocene large-scale valley filling took place, triggered by major eustatic changes coupled with climatic amelioration. The Holocene valley fills begin with coarse sediments, gradually ending up in a fining upward sequence. During the later part of the Holocene a definite decline in precipitation is envisaged (Sinha *et al.* 1983).

An explanation based on the study of palaeoclimate from different parts of the world provides us clues about the alluvial deposits in the upper and middle courses of the river and also on the possible palaeoclimatic condition of the area under study. During the Pleistocene, a succession of arid and humid phases had affected the humid tropics, continually modifying the vegetation cover and rates of surface erosion. The pattern of Quaternary climatic change in the tropics followed more or less the same pattern everywhere. There is evidence for an onset of Late Pleistocene cooling by 40 kyr and cool moist climates probably prevailed widely after 25-26 kyr, but the impact of full glacial conditions on tropical climates is most apparent between 20-22 kyr and 12-14 kyr, when widespread cooling and drying of climates is recorded from both mountain and lowland environments (Thomas 1994).

Coolest and driest climate occurred during and following the Last Glacial Maximum (LGM) centered at 18 kyr. The rapid change towards post-glacial conditions may have begun before 13 kyr and was certainly evident by 12.5 at most recorded sites. There followed everywhere a short but significant return to cooler and dryer conditions during the Younger Dryas Cold event, 10-11 kyr after which conditions favouring a return to rain forest in the humid tropics were established by 9 kyr, when inter tropical lake levels were also high once more (Thomas 1994).

Degrees of aridity during the LGM differed from place to place. Evidence from Southeast Asia also presents a similar picture. In Western Kalimantan, Indonesia (Latitude 0°, equatorial, rainfall 3200-5000 mm per year) there are large accumulations of Pleistocene alluvial sediments, deposited in the coastal plains, which fall into at least two groups: an older terrace containing abundant timbers dated >40 kyr at 6-12 m depth, and younger flood plain sediments for which there are two near-basal dates of 10.5 kyr. The older suite is intriguing, and it is interesting that similar dates have come from the 'old alluvium' in a coastal site in Perak, Malaysia (Thomas 1994).

The sediments may relate to prolonged Late Pleistocene low sea levels combined with drier levels. On the Indian Ocean marine oxygen-isotope record there are clear peaks at 85 kyr, 58 kyr and 40 kyr, all possibly relevant to the formation of Older Alluvium of Southeast Asia (Cullen 1981). It is sufficient here to point out that the large accumulation of sediment in Kalimantan appear to have been deposited as a result of rapid erosion in small catchments, presently in an equatorial environment. Sudden floods, and rapid deposition appear to have been the conditions of sedimentation, and whilst neotectonic movements in this area cannot be ruled out (Thomas 1994).

Palynological and sedimentological studies from northeast Thailand especially from Lake Kumphawapi in the Banchiang province reveal a striking vegetation shift during the Quaternary. Prior to the height of the last glacial period (20-40 kyr), forest in Northeast Thailand was dominated by pine and oak instead of the modern tropical deciduous forest. As the global climate became cooler and drier at the height of the glacial period (around 18 kyr), conditions became so dry in Northeast Thailand that many swamps and lakes dried out. As a result plant fossils that normally get preserved in these wet environments were destroyed and no fossil information was recovered on the vegetation of the time. However, when conditions began to improve Lake Kumphawapi began to fill, and the plant fossils that were preserved in the lake sediments from this time indicate that the vegetation surrounding the lake had changed markedly. Due to an increase in monsoonal rainfall during that early part of the Holocene Epoch (10-6 kyr), these forests was more diverse than their predecessors, and had clear similarities with modern Thai forests. Around 6.5 kyr many tree species decreased in abundance, while others disappeared from pollen records altogether. This striking forest decline is coincident with a substantial increase in the amount of microscopic charcoal particles preserved in the lake mud, a crude indication of fire in the lake catchment. The regional climate at the time of this episode was wet and warm relative to modern conditions, and there is no evidence to indicate a sudden change in climate to drier conditions that would promote natural burning. It is suggested that this might reflect the activities of prehistoric human populations (Penny 1999).

Studies made on microfossil evidence for changing salinity patterns in the Bay of Bengal over the last 20,000 years suggest reduced precipitation and river run-off in the northern Bay of Bengal during the last glacial interval (~ 18 kyr). During the LGM the salinity pattern probably results from decreased precipitation and decreased run-off by the Ganga-Brahmaputra and Irrawady river systems, the main rivers which debauch into the Bay of Bengal. Comparison with the modern-day resistant population of micro-fauna and associated surface water conditions reveals that during the LGM interval surface salinity in the Bay of Bengal were generally higher then today, especially in the north, while during the mid-terminal (MT) interval decreased salinity are indicated. These results also tally with the preliminary oxygen-isotope results (Cullen 1981).

This evidence confirms that during the last glaciation eastern and northeastern part of India including Myanmar experienced a much drier climate in comparison to the present. Rainfall was less, reducing fluvial discharge into the sea thereby increasing the salinity gradient. Calcrete has formed more or less contemporaneously with a microlith bearing colluvial horizon, in the Tarafeni valley of West Bengal, indicating severe reduction in the annual precipitation. Fluorine/Phosphate dates obtained from bone samples collected from this horizon suggest a Terminal Pleistocene age (Basak *et al.* 1998). Palynological, microfaunal and sedimentological studies carried out in the south Bengal basin show that even the coastal parts of these humid to sub-humid regions faced the onslaught of environmental variations during the terminal Pleistocene. The occurrence of mangroves (which are sensitive to sea-level changes) at Digha, Kolaghat and Diamond harbour at elevations of -23 m, -21 m and -24 m during the 32 kyr, 22 kyr and 14.46 kyr agrees well with the global sea levels which were about 125 m, 55 m and 120 m below the present sea levels during the relevant times. The pre-Holocene mangrove swamps has been overlain by the microfaunal foraminifera that indicate the transgression of sea during this period. The presence of calcrete in these 30-50 m deep deltaic sediments suggests an arid phase (Basak 1997).

Quaternary sediments of northeastern India consist of surficial deposits which have formed under various depositional environments — a) fluvial deposits occupying the Brahmaputra valley, intermontane valleys of Tripura, piedmont deposits flanking the Arunachal Siwaliks, narrow valley of Bomdila and Jayrampur; b) the glacial and glacio-fluvial-lacustrine deposits in Ziro valley, Arunachal Pradesh and c) lacustrine deposits of Loktak Lake, Manipur. Mapping of these sediments has led to a four or five fold classification of the unconsolidated sediments. The two basal older units are highly oxidized and partly consolidated, and are assigned to Pleistocene age. The upper two younger units are slightly oxidized and unconsolidated and are assigned to the Holocene age, based on morphostratigraphic, litho-pedologic criteria, and palynological remains corroborated by radiometric dating. A few intermontane basins and some isolated basins developed contemporaneously with the formation of the Brahmaputra Basin during the post-Siwalik Himalayan orogenic movement. Its development is linked with the phases of uplift, glaciation and erosion of the Himalayas and basement tectonics affecting the Shillong massif and basin of deposition. The intermontane valleys flanked by north-south trending folded ridges are filled with well-developed Quaternary sediments, which cover over 40% area of the state. The Upper Pleistocene terrace deposits, which overlie the dipping folded sequence of shale-siltstone, are highly oxidised into latosol and ferricretes at places. The upper part of the oldest terrace unit in Tripura is dated at 35,690 ± 3,050 B.P. (BS-450), by ^{14}C method. Sand plugs/dykes of various dimensions profusely intrude the oldest terrace (T1) formation of Tripura. This emplacement shows anomalous concentration of caliche nodules, which indicate the prevalence of semi-arid conditions during the Upper Pleistocene. In the Brahmaputra and adjoining valleys in parts of Assam, Arunachal Pradesh and Meghalaya fringes, generally four terraces have been mapped. The fluvial terrace deposit (T1) at Tipang, which is dissected, oxidized, orange to dark brown in colour, mapped in the southeastern corner of Assam, along Tipang nala, at Singra in Lakhimpur District (north bank of Brahmaputra) and Barak Valley (North Cachar Hills district), have given radiocarbon dates of 38,020 ± 2,230 B.P. (BS-573), 32,540 ± 130 B.P. (BS-746) and 40,000 B.P. (BS-783), respectively. The fluvio-glacial deposits of the Ziro valley in Arunachal Pradesh indicated 40,000 B.P. (BS-469), while the oldest terrace deposits of the Khowai and Hoara valleys in Tripura date 35,690 ± 3,050 B.P. (BS-450). Thus, the radiocarbon dates of these formations though geographically separated and diverse in origin are fairly comparable. Therefore, these formations are coeval and placed in the upper Pleistocene. The younger terrace deposits, which are extensively developed at lower levels at valley flats, close to and related to the present-day drainage system show negligible pedogenic and weathering profile and are greyish to yellowish in colour (Ramesh and Rajagopalan 1999).

A comparative study of data available from the Brahmaputra Basin, Arakan Youma Basin and small, isolated basins in the lesser Himalayas brings out that these sediments belong to two distinct ages namely, the Pleistocene and the Holocene. The older sediment shows varying degree of oxidation, while the later are unoxidised. There are no data to indicate a lower age limit for the initiation of sedimentation in the Brahmaputra Basin. There appears to be an appreciable break between sedimentation cycles of the Pleistocene and the Holocene in all the basins, as the sediments of the later are unoxidised.

The regional climate during the Pleistocene seems to be clear with convincing evidence from Eastern India and Southeast Asia in particular. The LGM heralded a period of cool, dry climate which brought a notable change of vegetation and landforms in this region which has been confirmed by palynological and palaeontological data. The present-day wet tropical humid climatic areas of the world experienced semi-arid environment during the LGM and as the Holocene approached precipitation increased. Thus, a similar situation must have prevailed in Garo Hills. A semi-arid environment is generally characterized by excessive soil stripping and seasonal rainfall after long dry spells. This excessive soil stripping from the Tura and Arbella range of mountains must have filled the subsided Ganol and Rongram river valleys to some extent. Also during the heavy seasonal rainfall the rivers and streams erode the catchment areas and the drainage is heavily loaded with sediments. Once the rains recede the river loses its capacity to carry the load. As a result of this at times the channel gets blocked, as the sediments are not carried down. This choking of the drainage can create alluvial mounds similar to the once present in the study area. Similar features have been reported from the Kalimantan area of Indonesia.

Both these factors were aided by the fracture-controlled drainage of the region. At Rongram, only 4 km upstream of the confluence of the Ganol and the Rongram rivers (Fig. 6) there is a fault. This is a fracture or a zone of fractures along which there has been displacement of the sides relative to one another. This fault extends for almost 5 km north-south interrupting the flow of both Ganol river and its tributary the Rongram river which flows westward from the south and southeastern corner of the study area, respectively. The Pleistocene sediments were obstructed from flowing downstream and it might have also triggered a ponding environment. But these faults were no more active during the Holocene. Thus the rivers were actively eroding, cutting through the sediments and depositing further downstream. As noted earlier on the basis of physical characteristics this sediment in the study area can be divided into two stratigraphic units. The first or the lower unit (Unit1) is composed of dark brown highly oxidized alluvium and the second unit (Unit 2) is composed of yellowish brown slightly oxidized alluvium. On this basis it can be inferred that the time periods of the formation of these units is different. There appears to be an appreciable break in between sedimentation. The break in sedimentation inferred on the basis of the rate of oxidization has been reported from other areas of Northeast India. In these areas radiocarbon dates have been obtained from these two units, which confirm that Unit 1 is Pleistocene in origin while Unit 2 is of the Holocene period. The physical characteristics of both the units from the study area are similar to the dated units from other parts of Northeast India. Thus, they seem to be the product of regional palaeoclimatic conditions of the area.

Field observations have also revealed that at Rongram, which is at 480 m AMSL, the division between the two units can be clearly marked but as we proceed further upstream, above 550 m AMSL the size of Unit 1 gradually thickens and Unit 2 is almost absent. On the other hand downstream of Rongram the size of the Unit 2 increases. It appears that in the upper course of the Ganol River and its tributary, the Rongram, deposition mainly occurred during the Pleistocene as a result of crustal movement. These crustal movements, the result of Himalayan orogeny 4 stopped in the Middle Pleistocene (Ramesh and Rajagopalan 1999). Stone Age industries have been recovered from Unit 1. In the begining of Holocene precipitation increased, the rivers began eroding the sediments from the upper and middle courses (Unit 1) and

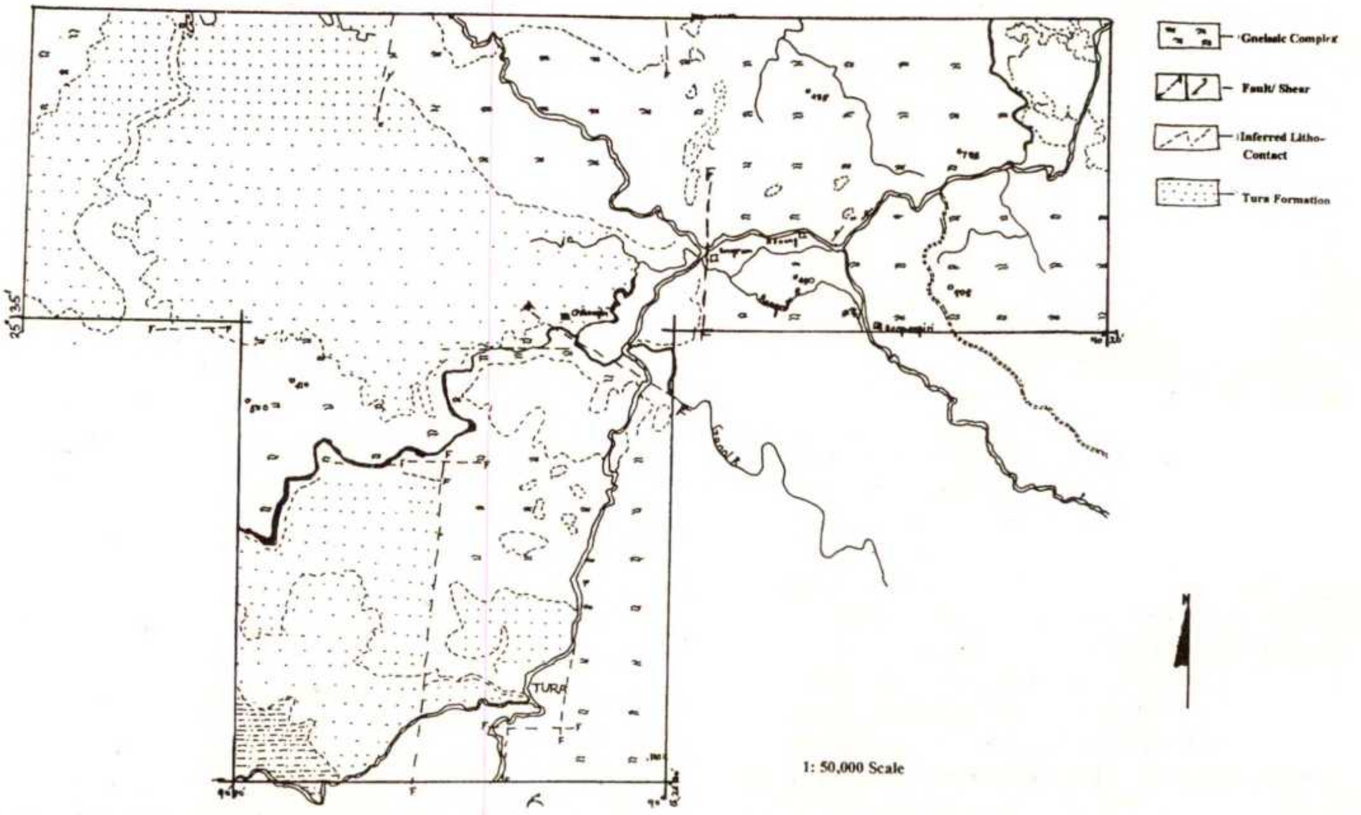

Fig. 6: Geological map showing faults

depositing them further downstream. The yellowish brown sediment seen below 550 m AMSL is better sorted and much finer. Lithic tools are also found in Unit 2 which belongs to the Holocene. People lived on the Holocene deposits, which were again capped by similar sediments and a thick humus layer. Downstream of Rongram the river basin gradually widens as it comes out of the subsiding basin and flows on a flat surface. The fault was not active. The flow of the river was uninterrupted and deposition is still occurring further downstream. In the study area the two main rivers are flowing on the bedrock. Deposition by a few first order streams in the study area is still continuing. These streams are eroding their catchment areas during the rainy season. These deposits are about a metre thick from which no cultural material of archaeological importance has been recovered.

The Sites

In the Ganol and Rongram valleys there are surface sites, near-surface sites and buried sites. In this study, an area with high artefact density is called a site and all other finds within a radius of one kilometre are identified as localities of that site.

Certain characteristic features of the sites can be noted. All the sites are within a range of 300 m from the nearest dolerite dyke and near a perennial source of water. The immediate vicinity of the main river Ganol and its tributary the Rongram was avoided by the Stone Age people in the area. This choice must have been made to avoid the menacing floodwaters during the rainy season. The majority of the sites are found within the deposits created by the first order and second order streams. Rongram IB and Bibragiri are the only two sites on the Rongram and Ganol, respectively. The altitude of Bibragiri prevents flooding of the site while at Rongram the river divides into two channels. This reduces the intensity of the floodwaters.

The site settings clearly focus on the 'home range'. Around each Neolithic site in the valley a considerable amount of cultivable land is present. The setting of the sites matches the settlement pattern of the present-day shifting cultivators of the area closely. The fertile alluvial deposits with gentle slopes suitable for cultivation were chosen for habitation.

The density and distribution of the sites with the flake-blade assemblage and bifaces clearly reflects pattern of resource utilization. From Bibragiri, Missimagiri, Mokbol Bichik and Didami, the sites from where this assemblages has been recovered, the people had access to three different topographical situations: a) a considerable stretch of upland areas in the form of the Tura and Arbella mountains; b) the valley in between the two mountains; and c) the comparatively flat flood plain of the Ganol river further downstream. Ample resources were thus available to the inhabitants of the area in particular patches during particular seasons. Thus, the site setting agrees well with the requirements of a sedentary hunter-gatherer community.

Site Preservation

Certain ideas about site preservation are discussed here in order to clear some misconceptions about the sites and the region. As it is a high rainfall area, tectonically active and hilly it is believed that the sites are usually disturbed. However, the uniform stratigraphy found at all the sites and the gradual change in rate of oxidation from the bottom to the top is a clear indication that no catastrophic disturbance has occurred in the area. Sites which have been reported thirty years ago are still found intact today (IAR 1966).

Traditional Garo villages consist of closely clustered houses. The rest of the area is used for shifting cultivation. They never till and dig the soil and take precautionary measures to avoid erosion. Under the system of rotation of fields a patch of land is cultivated for maximum of two years and then it is abandoned for at least eight years. In the past the period of abandonment was even longer. The vegetation soon rejuvenates. Rainfall is intercepted by taller plants, which break raindrop impact and prevent direct rainsplash on mineral soil. Organic leaf litter in various of stages of decomposition covers the ground and creates a topsoil layer that cushions water impact, while also acting as sponge to soak it up. The microfauna of the organic topsoil also maintain a spongy soil structure by converting organic residues into beneficial by-products, enhancing the aeration essential for good plant growth and allowing water to infiltrate the soil. This diverts surface water from rapid run-off. Meanwhile the rooting network helps bind the soil. The net result is that the impact of surface runoff is reduced, soil moisture is enhanced, and groundwater seepage is maintained, even during drier times of the year. Stream discharge immediately after heavy storms is reduced or delayed, and dry season flow is sustained. This controls erosion even during the rainy season (Butzer 1992).

At some sites like Mokbol Bichik I the tools are exposed on the bedrock. This may be the result of erosion or may be the tool makers occupied the bedrock and made tools from the dolerite dykes that are very close to the bedrock in both the areas.

These bedrock exposures are also not always visible. When the vegetation is thick in the area it is completely buried by tree litter and weeds which grow on it. Only when the land is cleared for cultivation this cover is removed. It stays exposed at present times for a maximum of two years and is covered for eight to six years. The number of years of exposure was even shorter in the past.

Crops are planted during these two years all around the bedrock. When the plants grow it is covered partially. During the sowing and harvesting season it is used as sitting platform. This is the time when the tools are fully exposed. There is minor displacement of the tools but no major erosional forces like water from a flowing stream etc. which could cause major displacement. The bedrock exposures, except at the site of Missimagiri are always at the foot of the mound. They form a flat surface and there is no scope of tools rolling down. The locus of the surface site of Chitra Abri, first reported in 1957 is still the same today.

The Artefacts

In the Ganol and Rongram valleys the archaeological record consists of only lithic tools and pottery. All the lithic tools are made of dolerite, which was the only suitable raw material available. Dolerite dyke exposures are prolific in the area and also dolerite river pebbles were used for making tools. Dolerite was available in great quantity and also in close proximity. The development of tool technology in the area was inevitably influenced by these factors. The dyke material was available in square or rectangular blocks in varying thickness and the river pebbles were round or oval shaped in different sizes. A study on the typology of the tools of the Ganol and Rongram valleys has indicated the presence of three varieties of assemblages. They are: (i) the celt assemblage, (ii) the core tool assemblage, and (iii) the flake-blade assemblage.

(i) The celt assemblage

This assemblage is the first reported lithic assemblage from Northeast India and from Garo Hills in particular. It was first reported from Garo Hills in 1931 by Walker and systematic studies have been undertaken from then by various workers (Dani 11960; Goswami and Bhagwati 1959; Sharma 1966, 1967, 1970, 1971, 1979; Rao 1970; Mahanta 1995). During the latter half of the last century workers have reported the presence of tools belonging to this assemblage upon any stretch of bare ground on the hill slopes, where they are usually exposed when the areas are cleared for shifting cultivation. This implies that these are either surface or subsurface sites. Stratigraphically it occurs within the yellowish brown alluvium (Unit 2).

Here this assemblage is typologically divided into three sub-assemblages. They are: (i) fully ground and polished celts, (ii) partially ground celts, and (iii) chipped celts . All the artefacts of this assemblage are heavily patinated. The thick patina on the tools makes it difficult to identify any part of the cortex for which it is difficult to ascertain the morphology of the raw material. In all the sites with these celts flakes have also been found some of which were probably utilized.

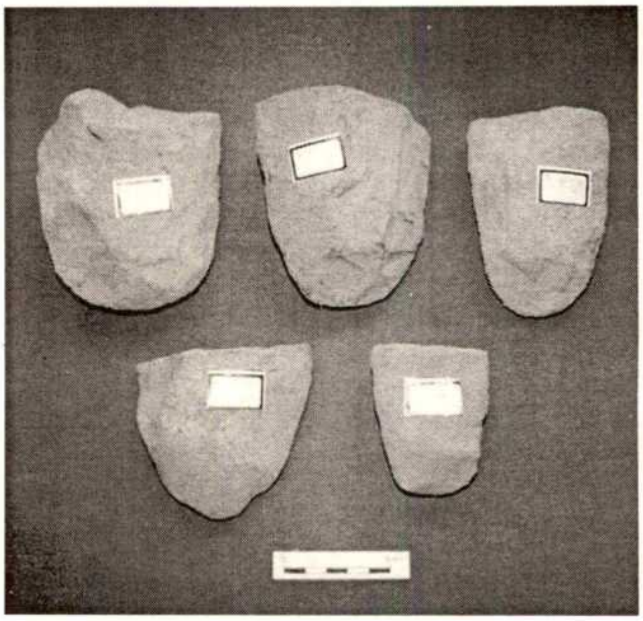

Fig. 7: Short axes

Edge damage visible in a few of the celts and their small size suggest that they were discarded after heavy use. Sixty per cent of the flakes found with the Neolithic tools possess positive bulbs, much larger then usually seen on flakes of this size. From this it can be ascertained that the sizes of both the types of artefacts have reduced as a result of incessant use. Thus, the tools were discarded after their utility reduced to the minimum. The presence of potsherds with the artefacts at Gawak Abri indicates food processing and storage. The absence of data on dwelling structures and use of plant and animal foods creates a lacuna in the archaeological record. From the typology of the lithic tools, one can envisage a group of people practising agriculture on the hills, using lithic tools but economising on their production and processing and storing food in earthen pots.

(ii) The core tool assemblage

This includes two sub assemblages — (i) pebble tools (Fig. 7), and (ii) the bifaces (Fig. 8).

Pebble-tool assemblage

This assemblage was first reported from Rongdu located in the northeastern part of Garo hills (IAR 1969-70). Within the study area the most convincing evidence has been reported from the Rongram IB site (Sharma 1991).

The short axe is the most common type of pebble-tool found in the area. Utilised flakes and chopping tools are the next most common type. At Rongram IB this assemblage occurs within the strong brown alluvium (7.5YR 5/8). At Bibragiri short axes only have been found in a half-

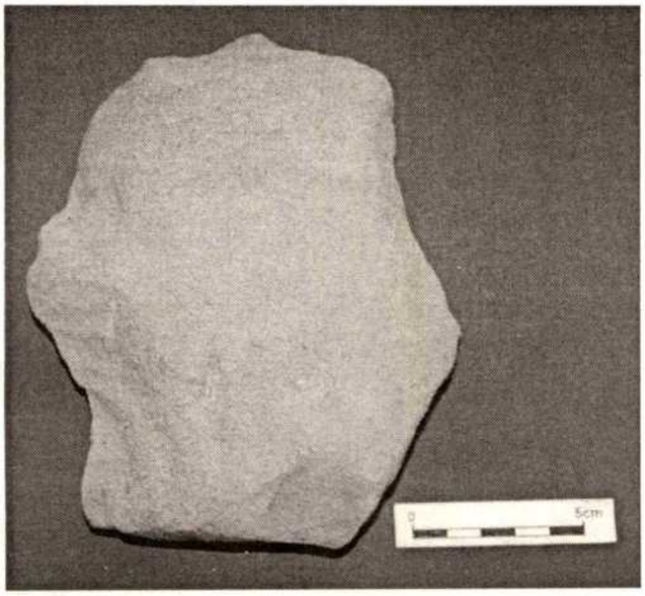

Fig. 8: Bifaces

buried condition in the strong brown colluvium along with the flake-blade tools. These axes also occur at Gawak Abri in a fully buried context.

The short axes are made on truncated river pebbles, which are bifacially flaked. No prepared striking platform is visible. Large, medium and small size shallow flakes have been removed by striking in the edges for the preparation of a curvilinear working edge. Maximum flaking is visible on the edges while in the centre shallow flakes are removed. For the preparation of scrapers and choppers pebbles of suitable size were selected and a few flakes removed for preparing the working edge. The major part of the pebble remains untouched or unflaked. On the basis of the size and shape of the flake scars it can be stated that these flakes were removed by direct percussion employing a hard hammer.

Bifaces

Tools belonging to this assemblage have been prepared on blocks or slabs of dolerite extracted from dykes. They are all bifaces of different shapes. The term biface here is used to define a core blank that has been reduced on both faces from two parallel but opposing axes through percussion and is shaped into a specific form (Kelly 1988). The different types are square biface, triangular biface, stemmed/abrupt scraper, hachoirs, concave scraper, convex scraper, bevelled biface, etc. At Rongram it occurs within the strong brown layer or Unit 1 and at Mokbol Bichik I it occurs on the bedrock while at Didami and Bibragiri it is found within the colluvium.

Certain characteristic features of these bifaces can be noted here. The majority of them can be classified under well-defined typological shapes. A truncated proximal end is a common feature, which is often confused as a part of the striking platform. In the absence of a positive bulb of percussion there is little doubt that these are truncated blocks. Usually only 30-50% of the total area of the selected block is flaked for the preparation of the artefact. Flaking is done mainly on the edges on both the dorsal and ventral sides. The rest of the area is left untouched. In fact these tools can be called edge retouched bifacial tools. Only a few are completely flaked on both the faces. The average thickness of the dolerite dyke blocks chosen for making tools varies from 5 to 20 cm. The length varies from 10 to 30 cm. They disintegrate into roughly rectangular or square blocks by natural process of weathering. For the preparation of an artefact uniform sized artefact blocks are easily available. Otherwise larger blocks are divided into two or more pieces as required. This results in a platform like surface on the proximal end. Actually such a surface is present all around the tool. But as a result of flaking the surface disappears from at least two edges while as flaking is rarely done on the butt end it retains the original surface.

(iii) The flake-blade tool assemblage (Fig. 9, 10)

Flakes can be defined as any objects detached from larger stone masses essentially possessing a positive bulb and a platform indicating human intent (Cotterell and Kamminga 1987). Any flake with sharp parallel edges and the length of which is twice its breadth can be called a blade. The blade-like flakes belonging to this group possess sharp parallel edges but the length is not always twice its breadth. Thus, they are called blade like flakes. Artefacts within this assemblage can be classified under the well-defined typological categories but in the absence of retouch in a majority of them classification is not free from doubts.

For matter of convenience the whole assemblage is divided into two groups. At certain sites the first group has

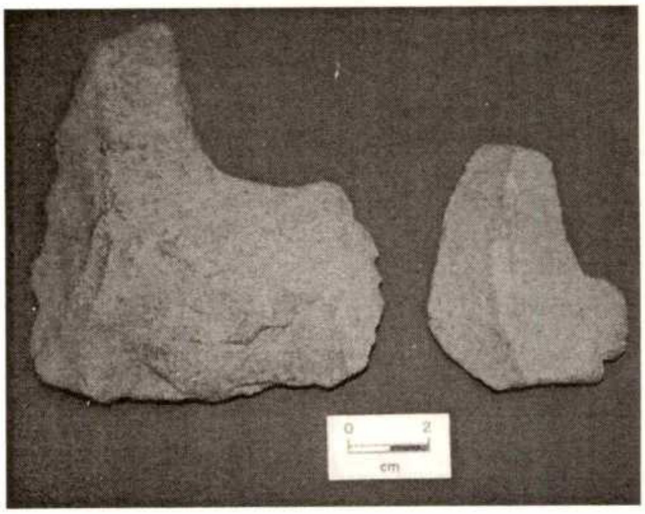

Fig. 9: Flakes with concave edges

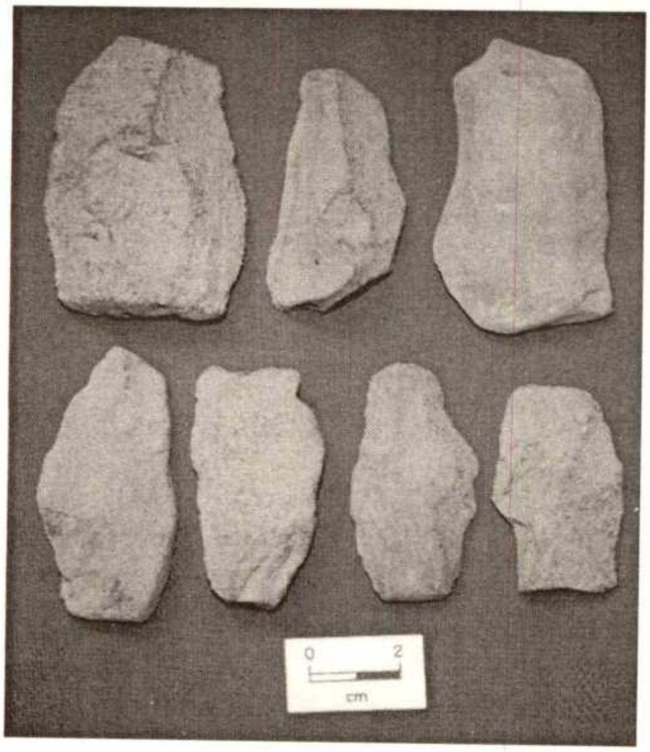

Fig. 10: Blade like flakes

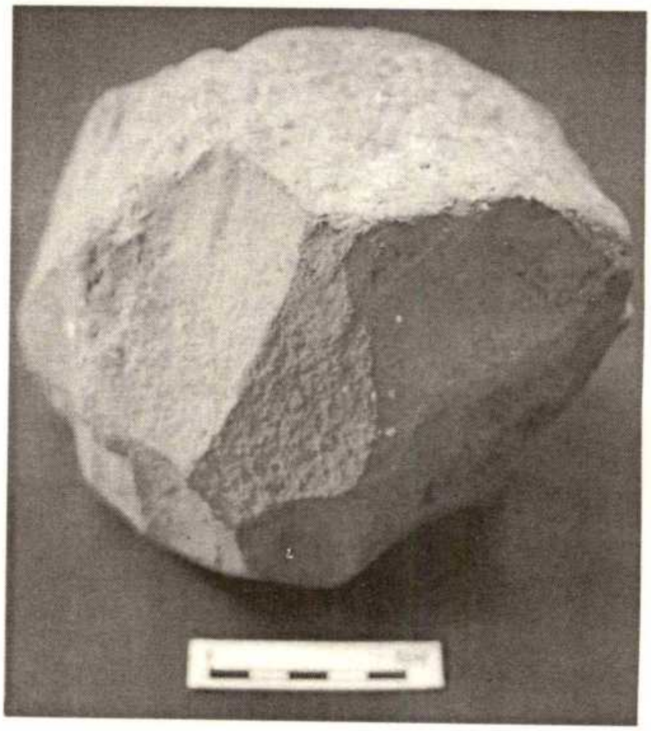

Fig. 11: Tabular core

been found from a particular stratigraphic context, the dark brown colluvium (Unit 1), and are associated with the bifaces. They outnumber the bifaces thus forming a dominant group. The first group includes the typical flake-blade assemblage of the area. Flakes that are found in association with the Neolithic tools are included in the second group.

The flakes of the typical flake-blade group (Group 1) are also either blade shaped or are amorphous in shape. The size varies between 1 to 10 cm. Stratigraphically they occurs within the strong brown colluvium. Study of cores collected from Didami, Gawak Abri and Missimagiri contributed to the understanding of the technique of flake production of the typical flake-blade assemblage.

Tabular cores are common (Fig. 11). These are made on dolerite boulders. Two platforms are seen at opposite ends of a boulder. Usually one platform is prepared while the other is unprepared. It is partially dressed but no attempt is made to prepare a cylindrical nodule. From the negative bulbs it can be estimated that two types of flakes were produced from the same core. From one side blade flakes were removed while from other side flakes of irregular shapes were removed. A few of the negative bulbs were very deep. This is possible because of the nature of the raw material. The direction of the force applied was almost vertical. As dolerite is a very hard material it is quite difficult to dress a boulder to the complete cylindrical shape necessary for the removal of blades. Thus, from the part of the core, which could be dressed blade-flakes were produced and from the rest of the core flakes of amorphous shapes were generated. The flakes were homogeneous in size. The technique was undoubtedly a prepared core technique showing indigenous development of technology in the area.

The character of the artefacts indicates homogeneity in size and shape of the artefacts. The high density of these flakes (60-70%) indicates stability of resources and repeated use of the sites. Increased sedentism, leads to expediently planned technology because of the cumulative availability of material (Nelson 1991). Artefacts in this assemblage consist of unretouched medium sized flakes and blade flakes. This indicates economic use of the raw material (Hayden 1989) which was not necessary.

The evidence of flake-blades belonging to Group 2 has been found at Gawak Abri in association with potsherds, chipped celts, short axes and ground and polished celts. The most distinctive character of these flakes is their small size (0.5 to 2 cm). In some of the specimens it was noticed that in comparison to the flake the positive bulb was much larg in size and it was almost in the centre of the ventral surface. This indicates that the flake was much larger and has got reduced in size due to excessive use.

Roughly cylindrical cores with diameters ranging between 6 and 7 cm with prepared striking platform at either ends has been found at Gawak Abri. Flakes measuring 1 to 2 cm in length and less in breadth were removed. Uniformity is noticed in the size of the flakes. This indicates that the force applied was controlled indicating a prepared core technique.

Pottery

Two types of handmade dull grey plain pottery were found in the same context. Of this one was coarse and gritty while there was a thin wash on the surface of the other variety on account of which it looked finer. The potsherds recovered are very small in size which makes reconstruction of the shapes difficult. No clay source could be identified in the study area. Also the use of not so well levigated clay indicates that poor quality clay was used mixed with quartz grits. The pots were fired in an open-fire.

Conclusion

Within India the typical flake-blade assemblage with the pebble short axes and the bifaces has no parallel. These assemblages belong to the same geological context. Short axe, the most frequently occurring pebble-tool is a classic Hoabinhian artefact, a culture dated to the Late Pleistocene period in Southeast Asia. In Thailand, with the Hoabinhian pebble-tools the occurrence of flakes and incipient blades is a marked feature. In the cultural level I of Spirit Cave in Northern Thailand retouched and utilized flake category is by far the largest and most interesting group of artefacts (Gorman 1970). Such an association was also reported from the Sai Yok cave of Western Thailand dated to the Early Holocene (Heekeren and Knuth 1967). Recent discoveries at the Lang Rongrien and Moh Khiew in southern Thailand have shown that a distinctly non-Hoabinhian flake-tool industry existed in southern Thailand at around 30 kyr. The fact that a somewhat similar industry, with dates in the 20 kyr range, is now recognized in Vietnam (at Nguom and Mieng Hosee Ha) suggest that medium-sized thin tools made on flakes may have been quite widespread during the later Pleistocene in Southeast Asia. The majority of these flakes and blades are unretouched and amorphous in shape but they show indications of utilization. These give support to the idea that the lithic flake tools in Southeast Asia were complemented by non-lithic using perishable materials such as bamboo and wood. These were only for processing and the specialized tools were made from organic materials.

The bifaces made on dolerite slabs have parallels within the Palaeolithic context of India. The presence of this trait in the study area may indicate diffusion, although it is also possible that the technique was an indigenous development.

One of the distinguishing characteristics of the lithic assemblages of Ganol and Rongram Valleys is the frequent occurrence of flakes with a concave edge. These have been found in different sizes with the Neolithic celts and also they occur in the typical flake-blade assemblage. These concave edges are very convenient tools for smoothening wood or bamboo. The metal knives used by the inhabitants of the area today also have concave edges, which they use for chopping, slicing bamboo into fine strips of various sizes, smoothening rough wood or sharp edges of bamboo, etc. Prolific occurrence of this type of tools clearly indicates heavy bamboo and wood working. This type of concave damage pattern was also noted in the lithic tools of Spirit Cave. Gorman suggested that it indicated working of small diameter wooden or bamboo shafts (Gorman 1970: 102).

An attempt has been made to reconstruct the reduction sequence of the three assemblages. A tendency to shape the tool by minimum flaking is obvious. The prepared core technique is unique to the region. The attempt to produce two varieties of flakes from a single core is noteworthy. The flakes are usually flat in character with a subdued bulb. Also the flakes removed on the short axes are shallow. This indicates a controlled flaking technique. The type of hammers used is hard to determine. Round granite pebbles found in the sites could have been used as hammers. These pieces are procured from particular areas which indicates they must have been brought to the site for some specific purpose.

In the absence of absolute dates from the area, dating of the assemblages remains arbitrary. On the basis of stratigraphy it is clear that the flake-blade assemblage, the bifaces and the pebble-tools belong to the Pleistocene period. From the geological evidence on the evolution of the landscape it is ascertained that the colluvial deposits started forming from the Middle Pleistocene period. On this basis the assemblages found within the colluvium can be dated to the Late/Terminal Pleistocene period. The celt assemblage in the area occurs within the yellowish brown alluvium which is Holocene in age. Earlier workers, on the basis of typology have divided the Neolithic into two phases. The early phase without shouldered celts was relatively dated to 5000 B.C and the later phase with shouldered celts was dated to 2000 B.C. Without its division into any phases this assemblage can be dated to the middle part of the Holocene period.

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Arjun 3, a Middle Palaeolithic Site, in the Deokhuri Valley, Western Nepal

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Abstract

This paper deals with the description and analysis of a Middle Palaeolithic site, Arjun 3, in the Deokhuri Valley in Western Nepal. So far it is the only Middle Palaeolithic site discovered in Nepal. The artefacts comprise blade tools, scrapers and points and discoidal cores prepared in a well-developed Levallois technique. The raw material is quartzite.

Introduction

Middle Palaeolithic sites are not as common in the Indian Peninsula as the earlier and the later industries. This is also the case in Nepal. The site of Arjun 3 in the Deokhuri valley in Western Nepal, is the only site with a Middle Palaeolithic industry discovered in over 15 years of work in Nepal.

Before describing the Arjun 3 site, a few words have to be said about the Indian Middle Palaeolithic. In India, the Middle Palaeolithic culture was recognised as a flake industry, succeeding the Indian handaxe-cleaver industry, only very late. A confusing number of names were given to this flake industry. The first scholars to describe such a flake industry, following the handaxe industry, were Cammiade and Burkitt in 1930 who called it "Series II". Later Todd (1939) described a flake industry above a Late Acheulian horizon at Khandivli as a "blade industry". In 1956, Sankalia designated such flake tools at Nevasa as "Nevasian" or "Series II" and still later (1962) discusses this industry as the "Indian Middle Stone Age", and described the principal tool and artefact types (1964). Thus this flake industry in India was called "Series II", "Nevasian", "flake-blade industry", "Middle Stone Age" or finally "Middle Palaeolithic" (Paddayya 1974; Misra 1989; Sali 1985-86, 1990). The confusion in naming this industry stems probably from the fact, that the Indian Middle Palaeolithic is not an easily recognisable industry such as the African Middle Stone Age. Most Middle Palaeolithic tool-kits in India do not show the clear-cut and well-developed Levallois technique with well-prepared discoidal cores and with Levallois-prepared flake tools, points and large blades, as known them from Africa, except in the Southeastern part of India, at sites near Renigunta (Raju 1988) and Nagarjunakonda (Bannerjee and Joshi 1975). This may be partly due also to the significant change in rock types in making tools: from quartzite in the earlier periods to mainly fine-grained siliceous rocks. The Middle Palaeolithic industries in India need a reevaluation. There seem to be many local varieties, caused by the different raw materials and the different environments.

Site Description of Arjun 3

The Middle Palaeolithic site of Arjun 3 was first discovered in March 1987, while working on the red soils in the Deokhuri valley. It is situated on the left bank of the Arjun river, which drains the northern belt of the Siwalik Hills and emerges into the Deokhuri Dun valley where it joins the Rapti river (Fig. 1).

The Arjun river, on entering the Deokhuri Valley, has formed a number of terraces, the highest being 30 m above the river level. A deep-red soil horizon has developed on this terrace. Recent strong erosion has left only remnants of the high terraces. The entire area is dissected into badlands with a block (Block II) of 30 x 10 m in dimension, retaining intact red soil remains on the 30 m terrace on the left bank of the Arjun river.

The terrace deposits are made up of a basal fluvial gravel of about 7 m resting on bedrock which is overlain by 6 m of silt followed by 5 m upper gravel lense and then the artefact bearing upper silt of 7 to 9 m thickness (Fig. 2). This upper silt is dissected intensively, and the whole surface around the blocks of the terrace remnants is covered with a surface scatter of artefacts (Fig. 3).

The entire area of the artefact scatter (an area of 90 x 90 m) was mapped and all surface artefacts were plotted

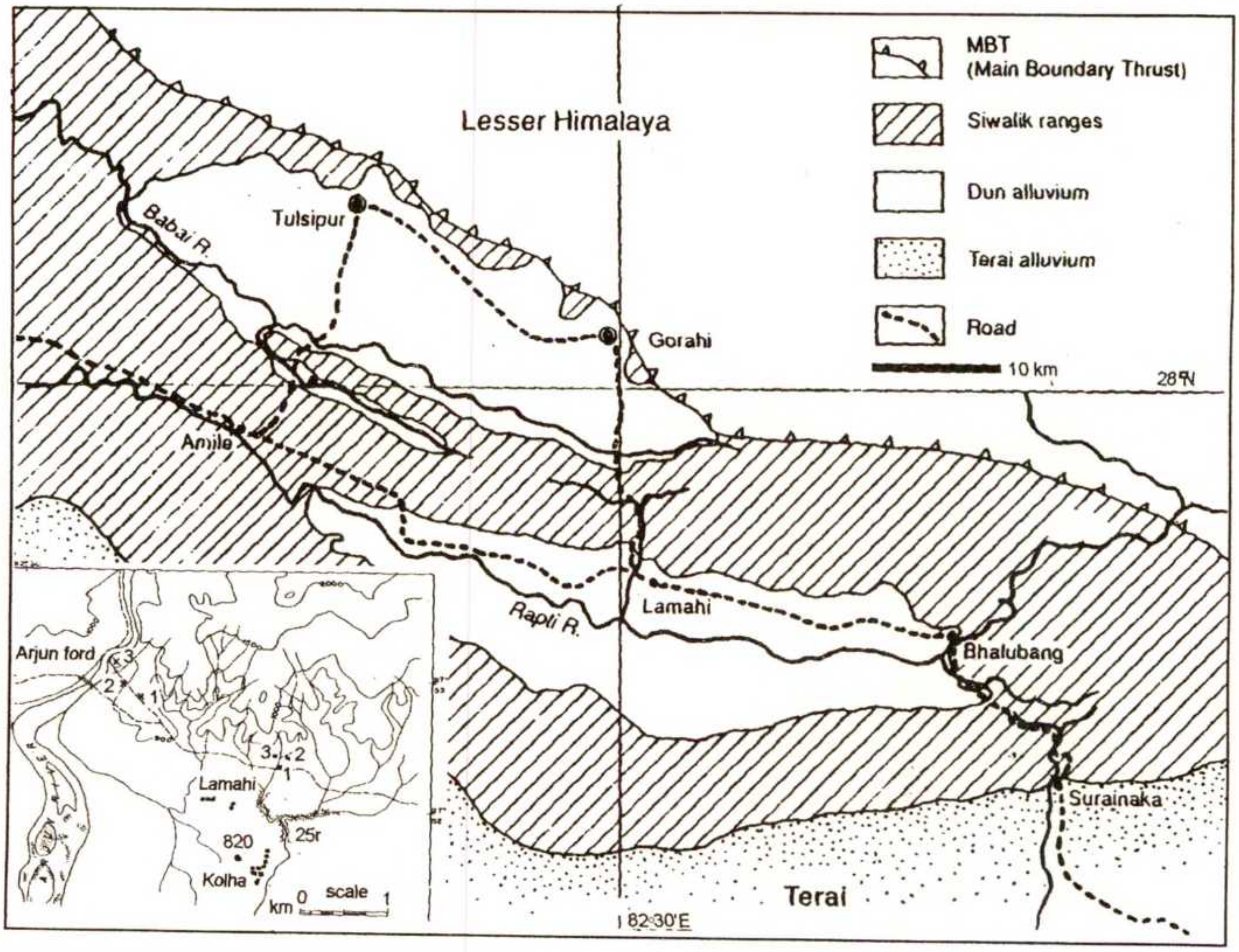

Fig. 1: Map of the Dang-Deokhuri area, Western Nepal, with inset map of the Arjun-Lamahi area.

(Fig. 2) in 1987. In 1988, 1989 and 1991 all newly eroded artefacts were plotted. More than 1350 artefacts have thus been collected from the site.

The survey revealed that the actual artefact-bearing horizon must have been at about 9 m below the surface of the 30 m terrace surface, at the base of the upper yellow silt, just at the contact with the underlying upper gravel. The eroded out artefact concentrations point to the probability that an occupation floor was present at this level.

The major concentration with 43% of artefacts (584 artefacts) is situated east and south of the small terrace remnant of Block III, within the squares E-3, D-4, E-4, F-4, G-4 and H-4 and further south, north of Block I (Fig. 2). Another, smaller concentration with 170 artefacts (13%) is at Block I. The remaining 600 plotted artefacts (44%) are from the rest of the plotted area. Each year new artefacts eroded out from the silt in these areas.

It is evident from this that the area around Block III, especially east and south of it, was the main occupation area. It is also significant that in this area a large number of tools are found. The blade element, too, is more concentrated here. A comparatively large number of tools is also found in the squares of B-8 to B-11 and C-6 to B-10, to the south of the main occupation.

The main site lies today 30 m east of the river and 22 m above the river bed. Considering the closeness of the older fluvial gravel just below the artefact level one must assume that the occupation site was at the ancient riverbank itself.

Since the collection of this site is not a selective one, the composition of the artefacts should reflect to a certain extent the original composition of the assemblage, taking into account, though, that it is a surface site and that a considerable disturbance has taken place after erosional

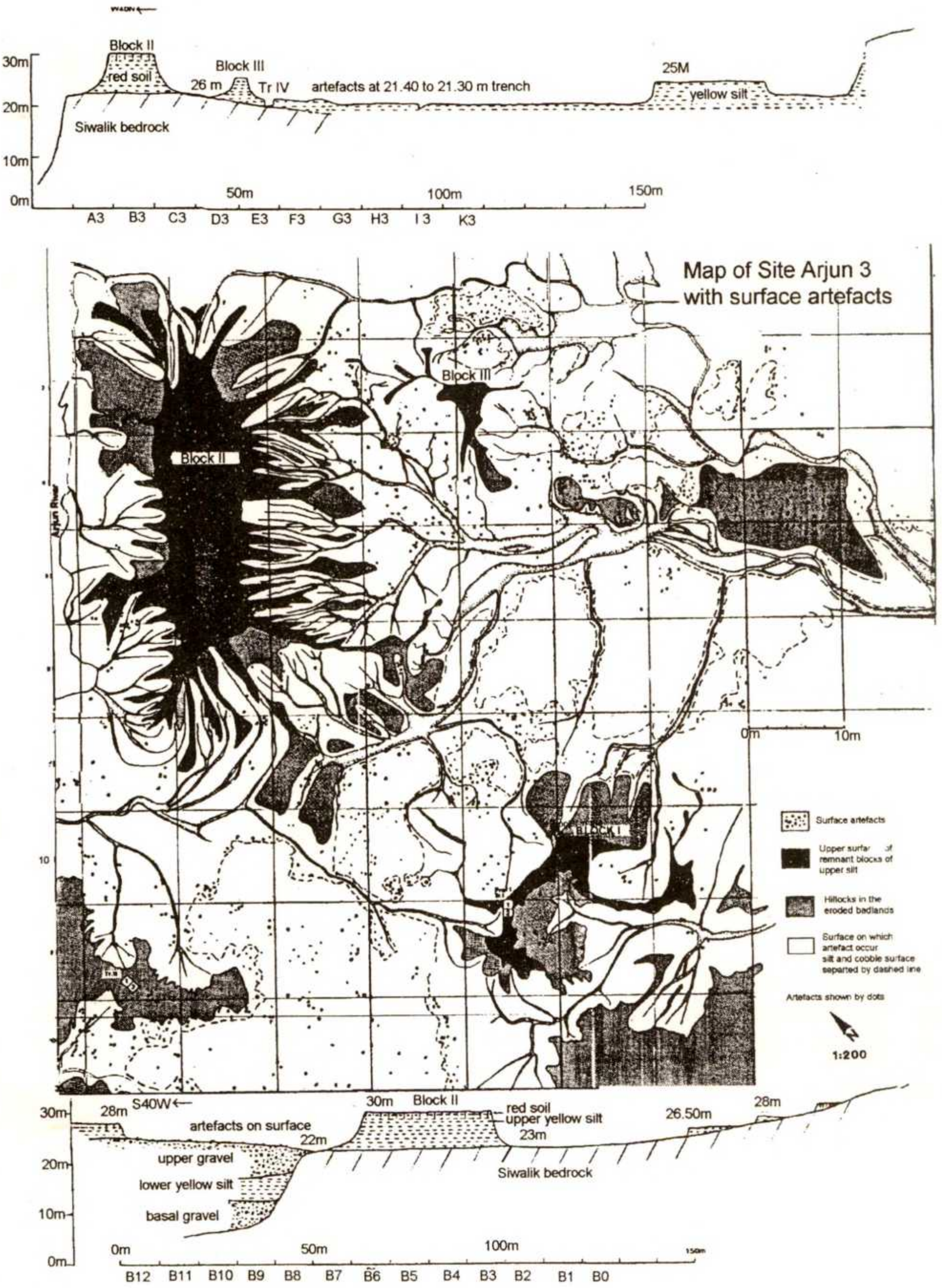

Fig. 2: Detailed map of the Arjun 3 site, with eroded out surface artefacts indicated in black dots. The main concentration is around Block III, mainly to the SE of it.

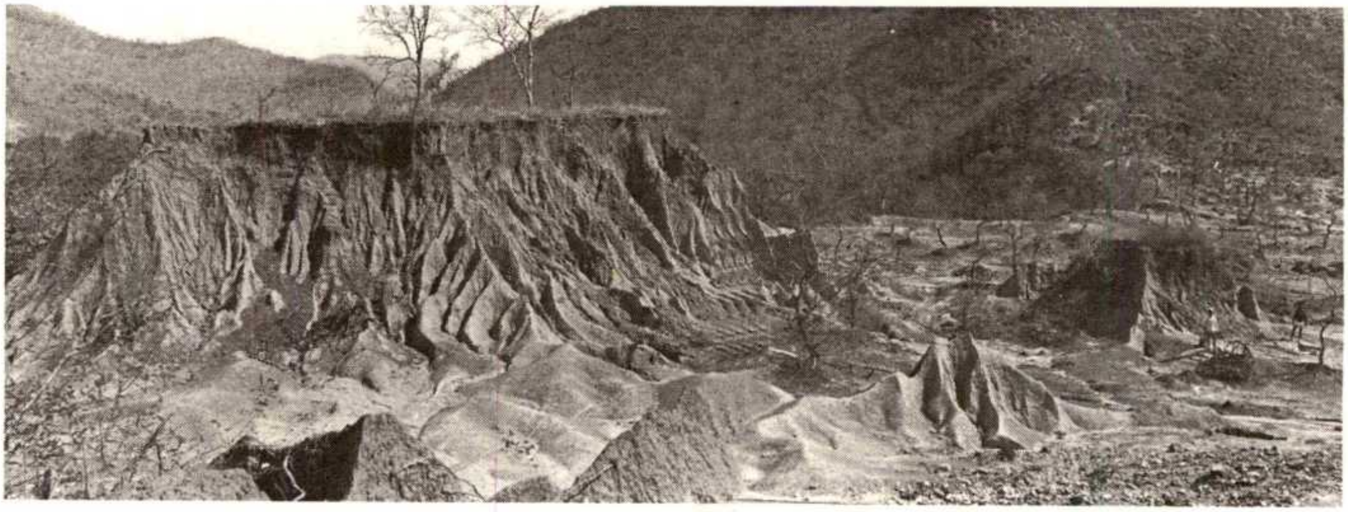

Fig. 3: View of the Arjun 3 site, in the centre is the extant terrace block of the once extensive 30 m surface

exposure, and that the smallest waste pieces must have partly been washed away.

In order to verify the presence of the artefact-bearing horizon in its stratigraphical context, a few small test cuttings were carried out. Test cutting I, in square E-9, was dug 2 m through the silt of Block I (with a surface level of 27 m above the river level) without reaching any artefact-bearing horizon. Cutting II in square A-9 was cut from a level of 24.80 m for about 1.5 m down without reaching any artefact level. Cutting III was cut into a silt cliff east of Block I in square G-9, where at a level of 24.05 m an artefact horizon was cut by the erosion. Here, this horizon was exposed from the top and revealed the remnant of a floor at this level. The artefacts were plotted and removed. Cutting IV was done in square E-3 at a level of 21.50 m (point D), and the artefact level is just slightly below it, as the artefacts were eroding out on the surface (Fig. 2). Cutting V, in E-4, was cut into a small hillock, and the artefact level was reached at about 21.50 m. Cutting VI, in F-4, exposed the artefact level at 20.75 m.

The artefact level of cuttings IV, V and VI is 9.50 m below the 30 m terrace surface of Block II. 45 m towards the south, at cutting III, the artefact level rises 3 m and is 6.30 m below the 30 m terrace surface.

At cutting IV, V and VI the artefact floor at the base of the 9 m yellow silt is overlying bedrock, with no intervening gravel. In cutting III the artefact-bearing horizon is situated in the basal part of the silt, a few centimeter above the underlying upper gravel.

The Arjun river at the time of the Middle Palaeolithic occupation was not as deep as it is today, but flowed in a gravel bed just below the occupation site. The northeast - southwest cross-profile through Arjun 3 (Fig. 2) shows that the ancient Arjun river, before the time of occupation, had cut its bed deeply into bedrock, as deep as today, and had subsequently filled its ancient channel with gravel and silt deposits up to the time of the Middle Palaeolithic occupation at a height of about 20 m above river level. After the occupation the aggradation continued with a 9 m silt up to the 30.50 m terrace level.

The red soil, developed on top of the 30 m terrace, and indicates a long time of warm humid monsoonal climate. It is probable that the Middle Palaeolithic occupation took place at a time before the last glacial period, maybe during the end of the last interglacial period.

The Artefact Assemblage of the Arjun 3 Site

The artefact collection of Arjun 3 is a complete and unselected collection. After the plotting of the site, everything was collected from the surface, after it eroded out from the sediment, including all the waste. The greatest percentage of the assemblage is made up of waste: cores, flake-like pieces, chips and irregular waste, almost all made from fine-grained quartzite. The sample of tools is small, but it is well defined and diagnostic. The site was in all probability a factory site rather than a camp site for the following reasons.

1. The scarcity of tools.
   Only 4% of the artefacts are tools (of which half were made on cobbles), while 7% are used flakes, 1.2% are used pieces and 1.5% consist of blades. The rest, 86.5%, is waste (Table 1).
2. The evidence for in situ flaking.
   This is seen in a number of flakes and other artefacts which fit together, sometimes to a core, sometimes to each other. In addition, many artefacts, especially

Table 1: Composition of Arjun 3 assemblage

Artefact types	**Tools**	**flakes used**	**waste used**	**cores**	**core fragment**	**flakes**	**blades**	**flake-like**	**chips**	**chunks**	**other waste**	**Total**
Total	56	96	17	66	15	671	18	157	134	105	19	1354
%	4.1	7.1	1.3	4.9	1.1	49.6	1.3	11.6	9.9	7.8	1.4	100

waste pieces, (even if they do not fit together directly), come from the same type of quartzite rock variety, indicating that they have been detached from the same core.

3. 70% of all artefacts are derived from flakes while about 15% are derived from cobbles, and the rest is undefinable waste. 40% of the cobble artefacts are cores and only 13% of them are tools.

The Arjun 3 assemblage belongs to a Middle Palaeolithic industry. It is characterised by the presence of — a) a well-defined blade element, b) flakes with well-prepared and faceted platforms, and c) discoidal, prepared cores. The industry is a flake industry, with flake and blade-tools and unretouched but usable flakes. The flakes are not only made from prepared cores but from a number of unprepared cores with cortical platforms. Though the majority of flakes of Arjun 3 have prepared or plain platforms, there are a considerable number of flakes with cortex platforms which have been struck from the cortical base of unprepared cores.

Apart from the flake and blade-tools, there is a characteristic component of large cobble-tools present at Arjun 3. They comprise of side, end and round choppers and of a polyhedron, and a few scrapers are made, too, from cobbles or chunks. Ninety one percent of artefacts are made from quartzite, while the remaining are made from "tuff", chert and quartz (Table 2).

Table 2: Artifact raw material

Raw Material	**No**	**%**
Quartzite	1238	91
Tuff	66	5
Quartz	15	1
Chert	24	2
Other	13	1
Total	1356	100

The composition of the artefacts (Table 1) shows that there are only 4.1% tools, 7% used flakes and 1.2% used pieces and 2.1% blades while 49% of all artefacts are flakes, 6% are cores and 30.6% is other waste. Although the percentage of blades is small, it is sufficient to indicate the presence of a well-defined blade element.

There are 49% unused flakes, the majority of which are probably waste flakes. The 30.6% of other waste consists of chips, chunks and flake-like pieces, so that together with the unused flakes the waste comes to 85.6%.

The size (L) of the flakes is between 10 and 80 mm with an average of medium-sized flakes between 30-69 mm. Amongst the chips and flake-like waste the average is also small: the chips have an average peak at 10-19 mm (57%), while 3% are even smaller than 1 cm, and the flake-like pieces are slightly larger with an average peak at 20-29 mm.

The Tool composition at Arjun 3

The artefacts consist a majority of heavy-duty cobble-tools of choppers (50%), 1.8% of polyhedrons and 7.2% of other heavy tools (a uniface, a biface, a pick and a worked chunk). 32.1% are scrapers and 3.6 are points, while 5.5% are hammerstones and anvils (Table 3). Together with the used flakes, used blades and used pieces the tool percentage comes to 13.5%.

Table 3: Tool composition at Arjun 3

Tool type	**No**	**%**
Choppers	28	50
Polyhedrons	1	1.8
Scrappers	18	32
Unifaces	1	1.8
Other	5	9
Hammerstones	2	3.6
Anvil	1	1.8
Total	56	100

Table 4: Technical characteristics of tools

Type of tool blank	**No**	**%**
Undefinable chunk.	1	1.8
split cobbles	4	7.1
Cobble	31	55.4
Slice	1	1.8
Flake	18	32.0
Chunk	1	1.8
	56	100.0
Type of trimming		
Unifacial	19	34.0
Unifacial choppers	24	43.0
Partly bifacial	2	3.5
Bifacial	8	14.3
no trimming	3	5.5
Secondary retouch		
Secondary retouch	47	84.0
no retouch	9	16.0
Cortex		
full	1	1.8
3/4	11	19.6
1/2	15	26.7
1/3	8	14.3
1/4	7	12.5
Little	5	8.9
Non	9	16.0
	56	100.0

The table of the tool characteristics (Table 4) shows that 62.5% of the tools are made on cobbles, while 32% are made on flakes and the rest are made of slices and undefinable chunks. The high percentage (77%) of unifacial trimming of the tools is due to the fact that almost all choppers are unifacial choppers. Only 17.5% of tools are bifacially or partly bifacially trimmed. 48% of the tools have much cortex i.e. they retain 1/2 or more than 1/2 cortex (this high percentage is again due to the unifacial choppers), while only 16 % have no cortex. Secondary retouch is to be found on more than 80% of the tools.

It is surprising to find a rather high percentage of cobble-tools in an assemblage with Levallois-like elements. It seems to be a special feature of the Arjun 3 assemblage in Nepal that besides scrapers, blades, points and used flakes the cobble-tool component of choppers is strongly significant . Even a number of choppers are cores rather than choppers, there is no doubt about the presence of a high heavy-duty tool component of unifacial choppers. The chopper element is a definite characteristic of the Middle Palaeolithic industry of Arjun 3.

Choppers constitute the predominant feature in the prehistoric assemblages known so far in Nepal. From at least the beginning of the Late Pleistocene, they seem to have been a major component in all Stone Age assemblages from the Middle Palaeolithic period onwards. The Acheulian culture is still too little known from the two sites discovered so far, but as far as can be seen now, the choppers do not play a role in the Acheulian in Nepal.

Description of the Tool-Kit at Arjun 3

The cobble tools

The heavy-duty cobble tool element of the Arjun 3 assemblage comprises of 28 choppers, one polyhedron, one uniface (Fig. 4 a-b), one bifacial tool and one pick

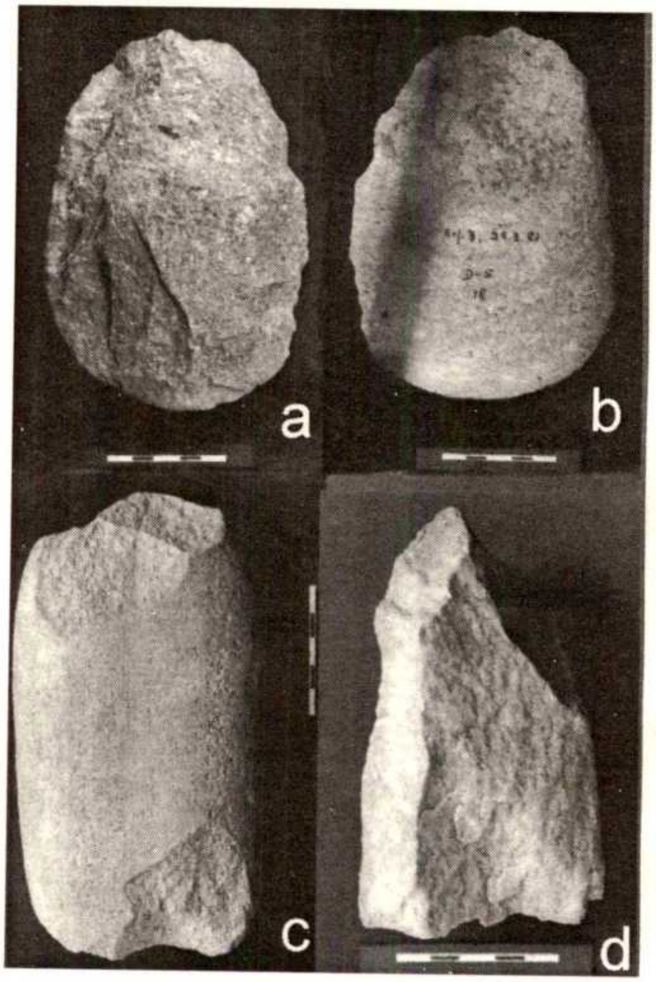

Fig. 4: a & b: Uniface (D-5/18); c: Double end-chopper (D-2/1); d: Pick (C-10/3)

(Fig. 4d). It is significant that core-scrapers are not part of the Arjun 3 assemblage. It seems that this steep-edged, unifacially trimmed tool belongs to the younger industries in Nepal, especially to the Late Palaeolithic Brakhuti industry.

Choppers

The edges of choppers, whether side or end, are trimmed unifacially from a cortex base. A few are made on split cobbles. Only one has a partly bifacial edge. Most choppers, 67% of them, are side-choppers and only few (26%, i.e. 7 pieces) are end-choppers, while only 3.5% are round choppers. Amongst the end-choppers, only 4 are true end-choppers on elongate cobbles. One of these (Fig. 4 c, D-2/1) is a double end-chopper and is not unifacial like the others, but both ends are bifacial. One chopper is a special tool as it has a convex, unifacial distal edge, which is rather a steep scraper edge, combined with a concave lateral unifacial edge. The rest are all more or less manufactured in the same fashion with unifacial lateral chopper edges of 60 to 75 degrees.

There are 19 side-choppers and 8 end-choppers. There is only one specimen of a round chopper. It is made from a split round cobble, with one part broken off so that the round circumferential edge is not complete; the lower face is of cortex, the upper face is the split surface; shallow primary flakes were taken off from the lower cortex around the circumference; there is also some unifacial secondary trimming. It is a fine tool and it may have been a uniface when it was complete, very similar to the other uniface illustrated in Fig. 4a-b.

All 28 choppers are unifacially trimmed, except an end-chopper which has a bifacial distal edge and a side-chopper which has a partly bifacial edge. One chopper has a bifacial ridge, caused by the unifacial trimming of two edges from the same face. All the other choppers, (i.e. 89%) are unifacial, of which 74% are trimmed from the cortex base.

Such unifacial choppers are also very common in the later assemblages with no apparent change in the types. Round-choppers become much more prominent in the later assemblages.

These heavy-duty tools are simple tools for heavy work and do not show any specialisation at Arjun 3. They are for the main part side-choppers and even the end-choppers are not the characteristic end-chopper type of the Sampmarg assemblage in the eastern part of the Deokhuri valley. Specialisation in the choppers becomes apparent only in later periods, for example in the Gidhiniya and Brakhuti assemblages, which reflects the change of tool-requirements in a changing environment, i.e. of changing activities under changing ecological conditions in the younger times.

Polyhedrons

There is only one polyhedron. It is made on a cobble and has 6-7 short, steep edges, partly bifacial, partly unifacial, and many flakes of all sizes were removed from around the entire circumference. Only little cortex is left on the tool.

Unifaces

One of the finest tools is a uniface or unifacial ovate, D-5/18 (Fig. 4 a-b), made on an original large side flake. The lower face is cortex. The upper face has a small remnant of the original flake surface in the centre, but the whole rest of the upper face is trimmed well by large, shallow primary flakes and by fine secondary retouch along the edges. It has a regular oval shape.

Bifacial tools

The bifacial tool, D-5/7 is not a biface in the true sense, but a longitudinally broken tool with bifacial trimming, made probably from a thick flake. It is an elongated, pointed tool with a round butt and one partly bifacially trimmed lateral sinuous edge.

Pick

The pick, C-10/3 (Fig. 4d), is a pointed tool, made on a split cobble, where a triangular-sectioned pick point has been roughly shaped from the upper face.

Scrapers and points

Scrapers

There are 18 scrapers, of which 13 (72%) are made on flakes and 5 on chunks or other waste. 6 are side-scrapers, 6 are end-scrapers, one has a distal and lateral edge and 5 are unspecialised scrapers. All, except 3, have dorsal unifacial retouch while 2 have ventral retouch (for example B-9/2 (Fig. 5b) and one scraper has dorsal and ventral retouch. Only 3 are pointed scrapers (for example D-4/15, Fig. 5c) and E-8/3, (Fig. 8 h)and one, (D-9/2, Fig. 5d) is a fine pointed scraper, with a convex scraper edge at the place of the removed platform, where the point is, however, not used. E-7/37 (Fig. 6a) is a round side- and end-scraper on a flake with a cortex platform.

Points

There are two points, made from prepared cores, with faceted platforms. The finest is I-4/1, (Fig. 6b) which has a well-retouched sharp point, retouched from the dorsal face. The other one has a rounded point, and is retouched from the ventral side.

Blades

The blades, though rare (with 2.1% of the artefact composition), are a distinctive feature of the Arjun industry. The

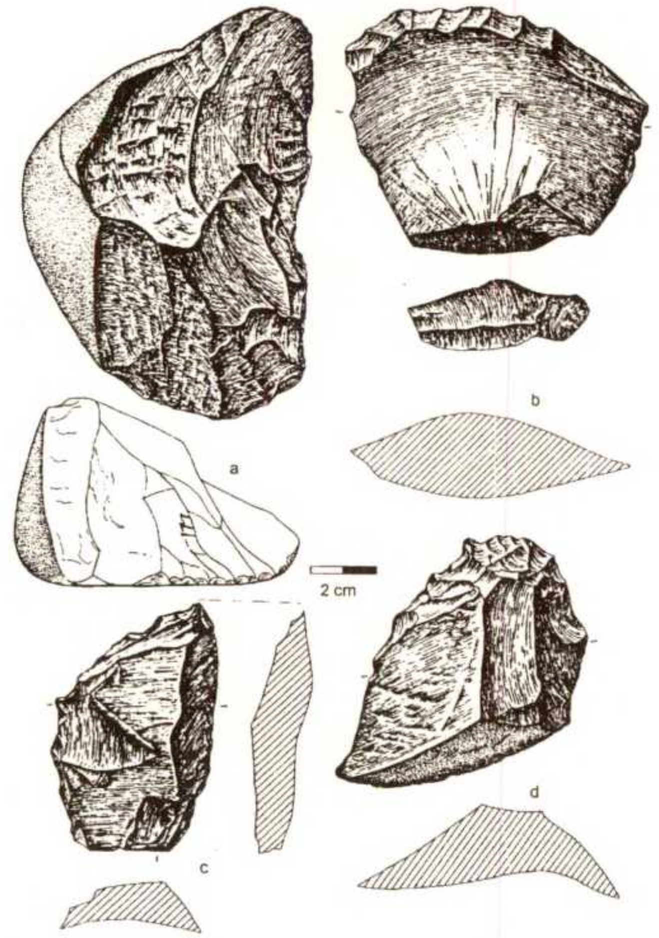

Fig. 5: a. End-cum-side-chopper (B-8/4); b. Scraper (B-9/2); c. Pointed side-scraper (D-4/15); d. End scraper (D-9/2)

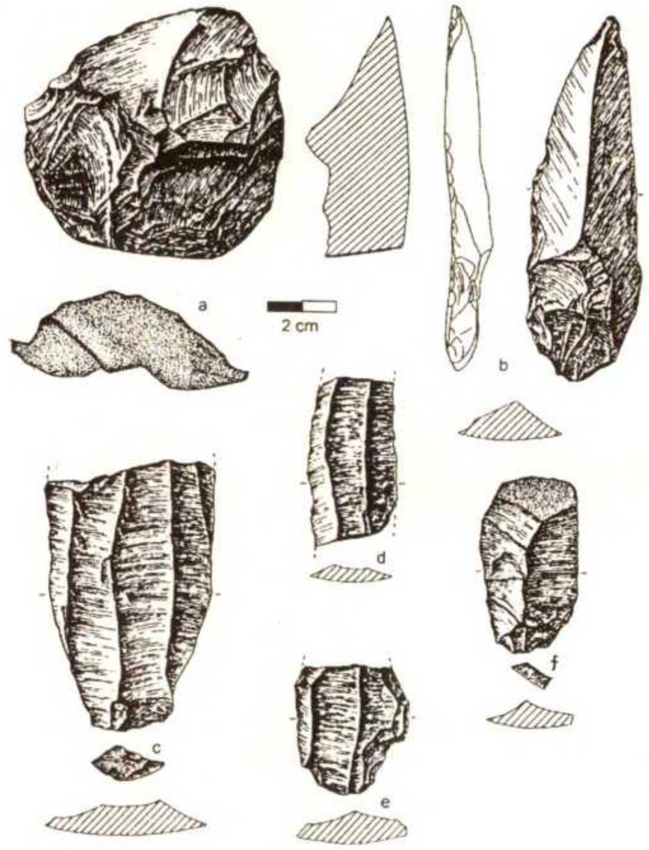

Fig. 6: a. End-cum-side-scraper (B-7/37); b. Point (I-4/1); c. Blade (E-5/11); d. Blade, snapped (C-10/18); e. Blade, snapped (D-4/1); f. Blade-flake (D-4/25)

blades are large, between 15 to 115 mm in length, averaging 20 to 50 mm. The breadth/length ratio has an average of 0.4, but 32% are snapped blades, so that the B/L ratios are distorted. E-5/11 (Fig. 6c) is the finest blade, a snapped, retouched blade. Two others are also snapped, retouched blades: C-10/18 (Fig. 6d), D-4/1,and (Fig. 6e). Other blade-flakes are for example: D-4/25 (Fig. 6f); D-3/26 made of tuff (Fig. 7a). Unretouched, but used blade-flakes are also present.

Statistical Analysis of the Artefact Assemblage

A statistical analysis has been undertaken of the Arjun 3 assemblage, in order to describe the technique of the artefact making and to understand the typical features and characteristics of the tools and non-tools. Besides that, the analysis should serve as a base for comparison with other Middle Palaeolithic assemblages, especially in India. Flakes and cores always show the best traits for describing the technique of manufacture.

The flakes

In all 785 flakes from Arjun 3 were analysed to show their special characteristics, in comparison to the flakes of the later Brakhuti industry. The size of the flakes shows that 61.5% are medium-sized between 30 to 69 mm (with a peak at size 30-39 mm), while 29.5% are small sized below 30mm, and only 9% are larger than 70mm. Three specimens are very large flakes above 150 mm, the largest being 225 mm. Only 8.7% of the flakes are smaller than 10 mm, though there must have been a larger percentage of small waste, which was either washed away or was unperceived in the silt and sand of the ground.

Table 5 points to some special characteristics. Only 21% have step retouch at the platform edges, which is a characteristic trait of the later Brakhuti flakes, and where they indicate the manufacture of flakes from the choppers and core scrapers. 14% are split flakes and 6% are snapped flakes, while 3% are blades and blade-flakes. 12% of the flakes have use marks.

The majority of (70%) the flakes have no cortex on the dorsal face (Table 6). This is in contrast to the much

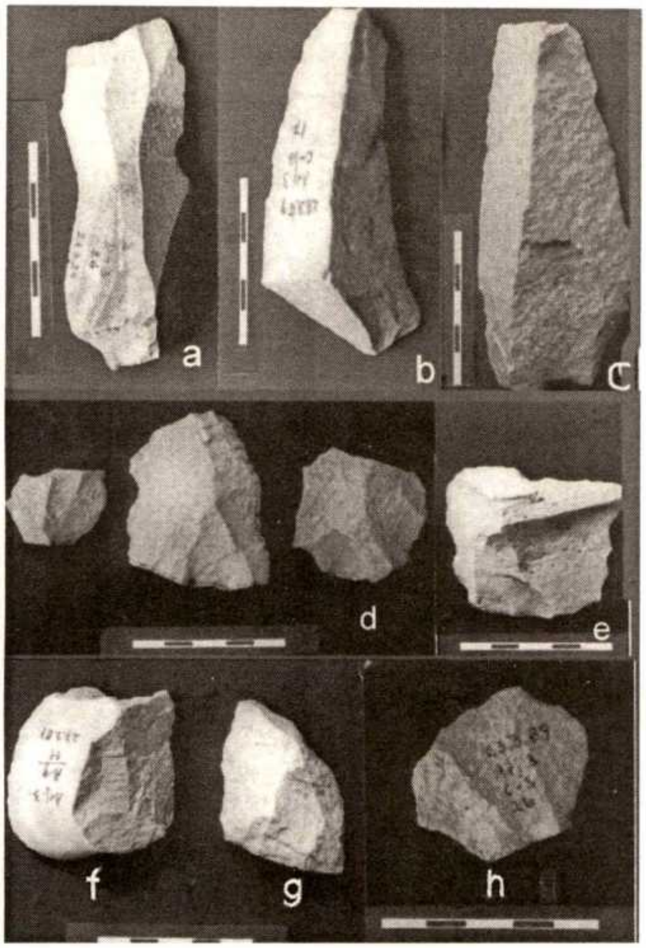

Fig. 7: a. Blade (D-3/26); b. Blade-flake (C-10/17); c. Blade-flake (D-4/37); d. Levallois flakes (G-5/1,16,19,3); e. Levallois flake (A-7/4); f. Orange flake (A-9/11); g. Utilised flake (A-9/14); h. Levallois flake (C-3/26)

smaller percentage for flakes of the Late Pleistocene Brakhuti industry. 18% have very little cortex, 3.5% have some cortex opposite the platform (indicating that they have been struck from shallow, flat cobbles), and only 5% are orange flakes, where the cortex reaches from the platform along one side to the distal end. These two last categories also indicate that they are part of the manufacturing process for choppers. With the Brakhuti industry these categories always have a higher percentage.

Table 5: Features seen on flakes from Arjun 3

Feature seen on flake	No	%
Step retouch	164	21
Split flake	110	14
Snapped flake	51	6
Broken	21	3
Used	96	12

Table 6: Dorsal cortex of flakes

Dorsal cortex of flakes	No	%
Full cortex	27	3.5
Cortex opposite the platform	27	3.5
Orange flakes	40	6
Little cortex	139	18
No cortex	552	70
Total	785	100

Table 7: Type of flake platforms from Arjun 3

Flake platforms	No	%
Cortical platform	250	32
Plain platform	257	33
Prepared platform	130	17
Broken	74	9
Indeterminate	74	9
Total	758	100

The flakes at Arjun 3 are well-made, (apart from the large percentage of waste flakes). The diagram for the type of platform of the Arjun flakes (Table 7) shows that a rather high percentage of flakes (17%) have prepared, faceted platforms, and sometimes very tiny platforms. 33% have plain platforms (which together comes to 50% for prior core preparation), while only 32% have cortex platforms. In the Brakhuti industry the percentage of cortex platforms is the largest. The platform angles of the flakes show that 61% have platforms smaller than 110°.

The dorsal face is not so predominantly one-directionally flaked from the same platform (Table 8), as those from the Patu industry or those of the later Brakhuti industry, but they also have radial flaking (from prepared Levallois-like cores) or multidirectional dorsal flaking (from cores with multiple platforms).

These statistics point to a well-developed and well-defined flaking technique of the Arjun 3 industry.

The flake component shows that a well-defined Levallois element is present, indicated by prepared and

Table 8: Type of dorsal flake scars from Arjun 3

Type of dorsal flake scars	No.	%
Same direction	286	36.5
Same direction and opposed	152	19.5
Multi-directional	122	15.5
Radial	64	8
Other	56	7
Indeterminate	78	10
Cortical	25	3.5
Total	758	100

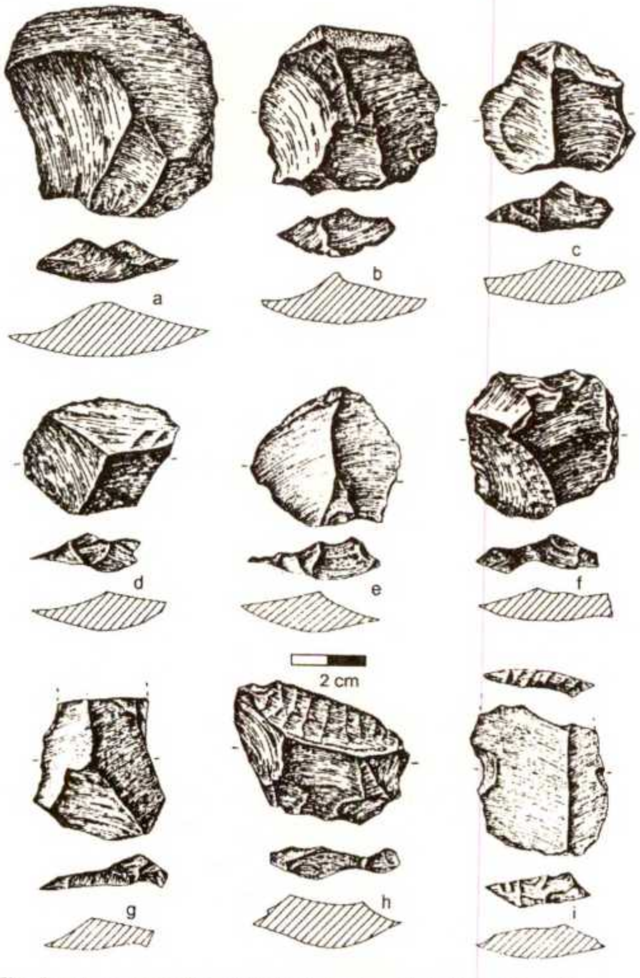

Fig. 8: a. Levallois flake (C-7/24); b. Levallois flake (B-10/7); c. Levallois flake (D-5/5); d. Levallois flake (D-5/15); e. Levallois flake (E-3/25); f. Levallois flake (E-6/8); g. Utilised flake, snapped (E-3/35); h. Utilised flake, pointed (E-8/3); i. Utilised flake (E-8/6)

faceted platforms and by the presence of radial dorsal flaking from prepared cores, which correspond with the discoidal, tortoise-shaped cores: Fig. 8a (C-7/24), Fig. 8b B10/17, Fig. 8c (D-5/5), Fig. 8d (D-5/15), Fig. 8e (E-3/25), Fig. 8f (E-6/8), Fig. 8g (E-3/35), Fig. 8i (E-8/6), Fig. 9d (E-3/21), Fig. 9g (C-3/22).

Many of the flakes are well-shaped and they are usually used, for example: a used pointed flake: Fig. 8 h (E-8/3), or flakes Fig. 8d (D-5/15); Fig. 8e (E-3/25); Fig. 8f (E-6/8).

Some flakes have been snapped and used, e.g. Fig. 8 g (E-3/35); Fig. 8f (A-8/15), and Fig. 9g (C-3/22).

Many flakes seem to have been utilized, though they are not retouched, e.g. Fig. 8i (E-8/6); Fig. 8b (B-10/17); Fig. 9a (C-5/2); Fig. 8a (C-7/2); Fig. 9b (D-4/35); Fig. 8c (D-5/5); Fig. 8d (D-5/15); Fig. 8f (E-6/8); Fig. 9c (E-6/9).

A number of flakes seem to be rejuvenation flakes from the production of choppers: Fig. 9e (A-4/6) and Fig. 10f (C-9/1). So-called orange flakes are from the manufacture of large cobble-tools (Fig. 10f, A-9/14).

There are a few flakes which fit together: Fig. 10a (F-4/8+40), Fig. 10b (F-4/12+13), and a few flakes fitting to cores, for example: Fig. 10c (D-4/53+55), and 3 flakes fitting to a chunk Fig. 10d (G-6/2, 5, 7, 8). Some flakes have been struck from the same core, e.g. F-5/6, 7, 8, 13).

The cores

The cores at Arjun 3 show a considerable variety. The cores have been categorised into two major groups with several sub-groups: A) the prepared, non-cortex platform cores, and B) the unprepared, cortex-platform cores.

The most conspicuous cores are simple 1-platform cores (core type B.1). These are quartzite cobbles where the platform is a flat cortex base from which a number of flakes have been removed, usually unifacially. Equally pronounced are prepared cores of discoidal, tortoise-shaped character (core type A.1). Similar, but less regularly prepared cores belong to core type A.2. Core types A.1 and A.2 are well prepared and show levallois-like features. Many flakes correspond to such prepared cores, where the platforms show faceting, and the dorsal faces show preparation prior to detachment. A few conical/cylindrical cores for blade detachment (type A.3) are present, too, but larger blade-cores have not been found, although such blades are present. The polyhedral cores (type A.4) are small, prepared cores, a variety of the discoidal core. Of the 64 described cores 37 (58%) are prepared, and 27 (42%) have unprepared cortex platforms.

A.: 1) prepared, discoidal cores, of tortoise shape, for example: Fig. 11b (B-8/9); Fig. 11a (D-4/12); and Fig. 11c (D-7/5). There are 7 examples of this type of core;

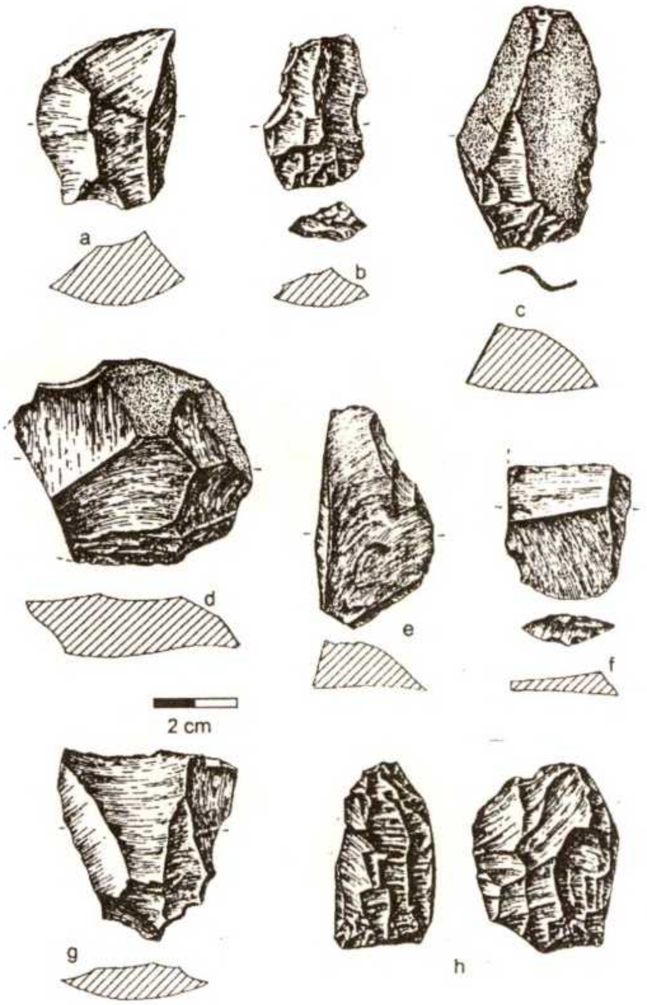

Fig. 9: a. Utilised flake (C-5/2); b. Utilised flake (D-4/35); c. Utilised flake (E-6/9); d. Radially prepared "tuff" flake (E-3/21); e. Utilised split flake (D-8/3); f. Snapped flake (A-8/15); g. Snapped flake (C-3/22); h. Cylindrical core (E-6/10)

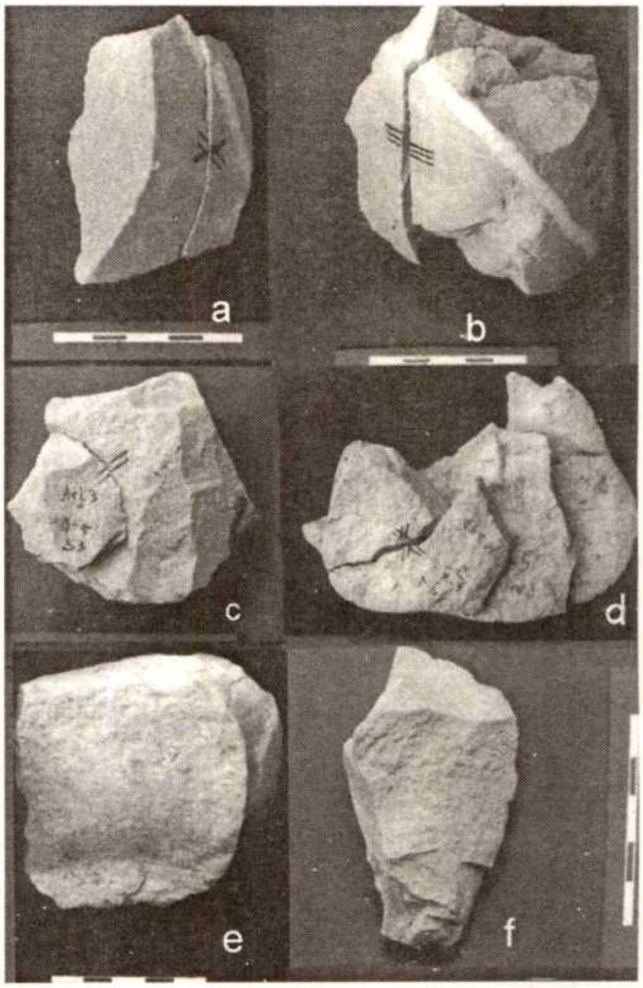

Fig. 10: a. Refitting flakes; b. Refitting flakes; c. A flake refitting to a core; d. 4 flakes refitting to the same core; e. utilised flake; f. "orange" flake

2) almost discoidal or irregular discoidal cores, or example, Fig. 12a (D-7/7). There are 14 examples of this type of core;

3) prepared cylindrical cores;

4) polyhedral cores, for example: Fig. 12d (D-9/3); Fig. 12b (E-5/1);

5) cores with two bifacial platforms opposite each other, like Fig. 13b (D-4/31);

6) cores with two prepared platforms at right angles to each other, like Fig. 12c (F-4/1);

7) cores with a platform consisting of one flake surface;

8) cores with three platforms from flaked surfaces;

9) cores with two platforms (one flake face, one cortex);

10) cores with zigzag bifacial, alternate platforms.

B. 1) cores with one cortex platform for example, Fig. 14a (C-11/16); Fig. 14b (F-5/1) of which, there are 18 specimens;

2) cores with two cortex platforms opposite each other of which there are 8 specimens;

3) cores with two platforms at right angles;

4) unifacial cores with flakes taken from the cortex of the lower face 1/2 or 3/4 around the circumference, 4 specimens;

5) irregular core fragment with a fitting flake from a cortex platform: with fitting flake13 specimens.

The core preparation corresponds well with the characteristics observed on the flakes, i.e. the prepared/faceted and plain platform types, as well as the dorsal characteristics on

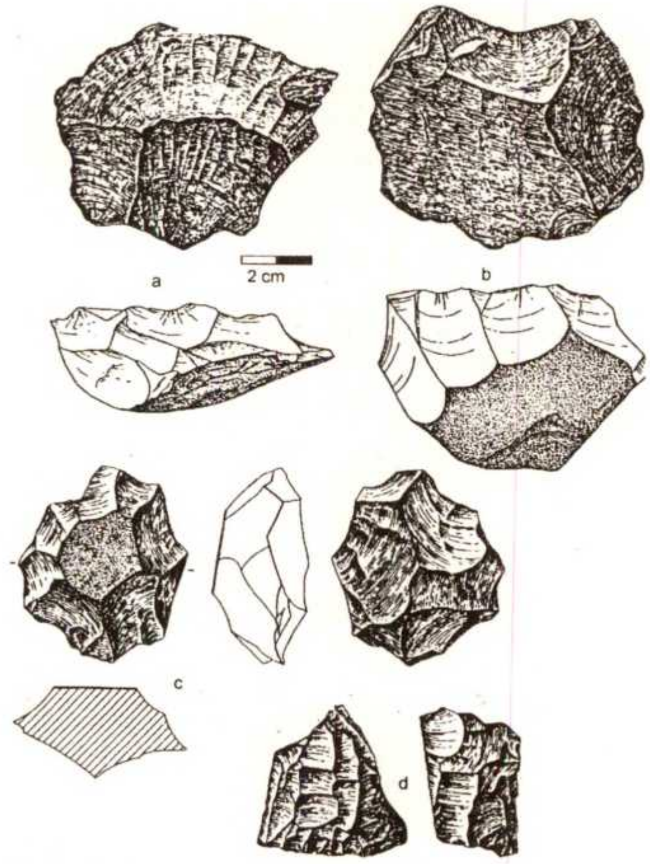

Fig. 11: a. Discoidal core (D-4/12); b. Discoidal core (B-8/9); c. Discoidal core (D-7/5); d. Cylindrical core (B-8/13)

Table 9: Platform angles for flakes from Arjun 3

Platform angle(°)	No	%
90-99	98	15.3
100-104	130	20.3
105-109	164	25.6
110-114	141	22
115-119	77	12
120-125	30	4.6
Total	758	100

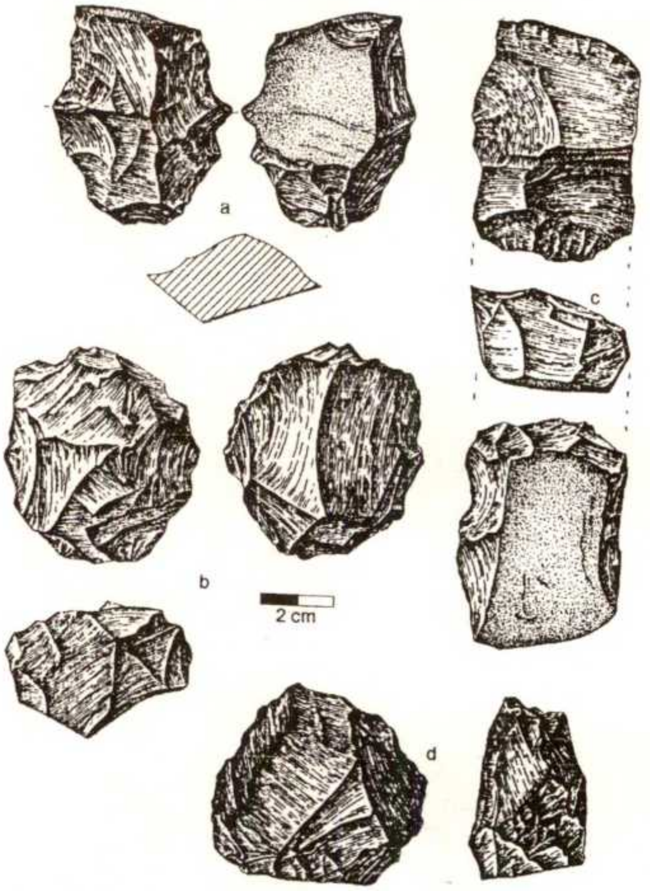

Fig. 12: a. Almost discoidal core (D-7/7); b. Polyhedral core (E-55/1); c. Core with two prepared platforms at right angles (F-4/1); d. Polyhedral core (D-9/3)

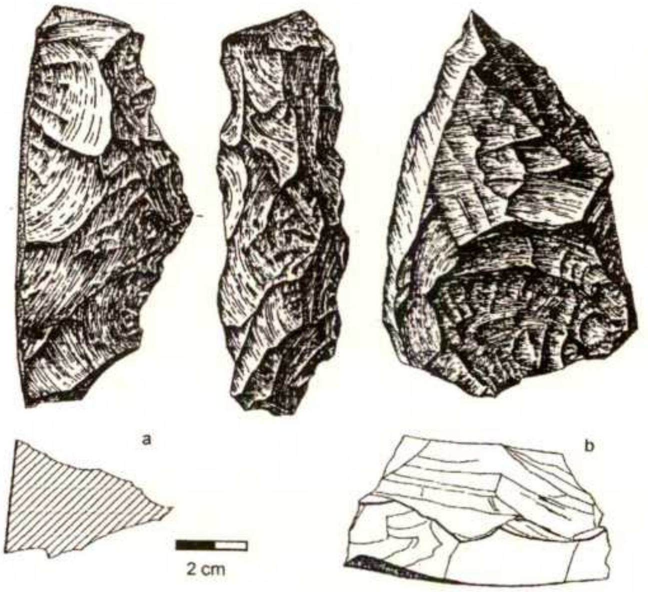

Fig. 13: a. Core with two cortex platforms (E-9/7); b. Core with two bifacially trimmed platforms opposite each other (D-4/31)

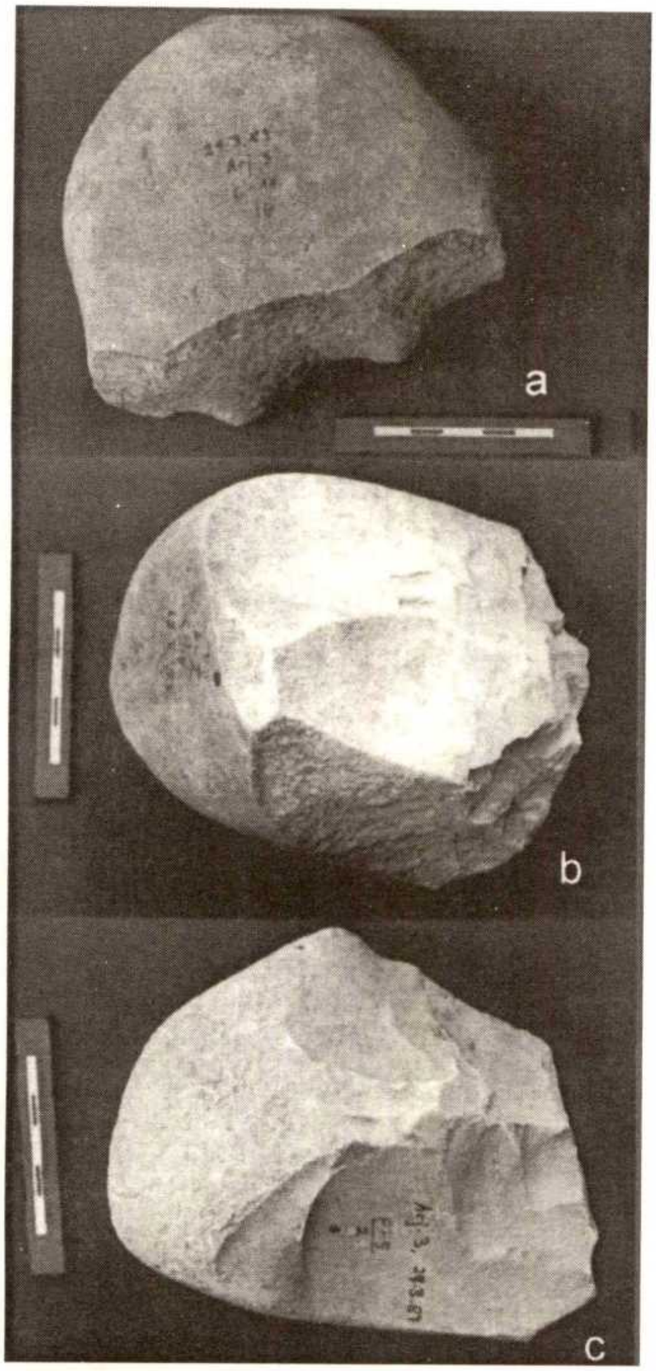

Fig. 14: a. One cortex platform core; b. One platform (flake) core; c. Core with two platforms (one flake face, one cortex platform)

the flakes. It indicates a large proportion of intentional preparation prior to the detachment of the flakes.

The rather high percentage of cortex platforms on the flakes, however, shows a tendency towards simple, unrefined flake manufacture for the removal of flakes during the process of the large cobble-tool manufacture. This tendency clearly continues into the later Stone Age periods in Nepal and is particularly clearly observed in the Late Palaeolithic Brakhuti industry of flake-chopper assemblages (Corvinus 1995, 1996) and also in the Mesolithic industry of Patu (Corvinus 1985, 1989)

Summary

The site of Arjun 3, in the Deokhuri valley in the Siwalik Hills of Western Nepal, is the only Middle Palaeolithic site so far discovered in Nepal. It is in stratified context, embedded at the base of an alluvial silt of 9 m, which is part of the older 30 m terrace of the Arjun river. The heavy erosion, which has transformed the older set of the alluvial terraces into badlands has exposed the occupation floor. A few test-pits have verified the position of the floor at this level.

The assemblage belongs to a Middle Palaeolithic culture, considering its technique and its tool and artefact composition The technique employed was a Levallois, prepared-core technique, with discoidal, tortoise-shaped cores, as well as large blade cores. Blades and points, though rare, are a characteristic part of the tool-kit, apart from scrapers of various kinds and of large cobble-tools of choppers, unifaces and picks. Handaxes are not found. The raw material is almost entirely quartzite, but a well-chosen, fine-grained type of quartzite, which splits well. Chert and other siliceous material is very rare.

The site seems to have been a factory-cum-camp site. However, the association of 4% of well-defined tools points to the possibility that the site was used as camp, as well. The river was close by, and it was probably a perennial river, like today. It was a well-selected site at the mouth of the river where it emerges from a deeply cut gorge into an open valley: the gorge and the hills in the back, the open valley in front.

The absence of bones and the absence of evidence of fire does not necessarily point to the site being not a camp, as the site is very disturbed by erosion and the evidence of bones and of fire may have not been preserved, if there had been any.

A comparison to Indian Middle Palaeolithic sites is not attempted here because of the absence of comparable statistics. However, it is hoped that the statistics and the plates of the artefacts, given here for the Arjun 3 site, may help in future to define its cultural position within the Palaeolithic history of the Indian Subcontinent. A few thermoluminessence dates of samples taken from the site, are still outstanding and will in future assign a chronological level to the Arjun 3 site.

Acknowledgements

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Preliminary Geoarchaeological Studies in West Bengal

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Abstract

This paper is a preliminary attempt to understand the relationship between changing landscape and archaeological sites. An effort has been made to throw light on cultural adaptations and human behaviour through time, from the Late Pleistocene to the mid- Holocene period in selected regions within West Bengal. Fieldwork was carried out in the Western Uplands and the alluvial regions of North, South and Central Bengal. In the Late Pleistocene, early hunter-gatherers occupied the present sub-humid parts of the Western Uplands which were then relatively arid. During the Middle to Late Holocene a low energy flood plain environment dominated in the alluvial parts of West Bengal, while in the last 200-400 years there has been the prominent development of sandy levees. The Chalcolithic to Early Medieval adaptation occurred in a low energy flood environment where sites were not exposed to catastrophic floods but only "nuisance" floods.

Introduction

In the Bengal Basin deltaic processes have been active since the Pliocene. Evidence for subsidence uplift and cyclical climatic changes in the form of humid to semi-arid phases has been found with a distinct Late Pleistocene 100-150 m lowering of sea level, marked transgressive phase around 7 kyr and a minor transgression around 5 kyr. Fluvial-deltaic and estuarine processes in a humid climate have dominated the landscape of the Bengal Basin during the Early and Mid-Holocene periods (7-5 kyr).

There has been some interesting research on the Holocene palaeoenvironment of Bengal Basin. Critical analysis of the bioassemblages of Holocene sediments of the South Bengal Basin has provided some understanding of the development of the delta in the immediate past as well as the changes of environmental facies in the area. Recently Stanley and Hait's work on the Bengal delta has suggested that it (past 7 kyr) developed in response to neotectonics and sea level changes during the Holocene (Stanley and Hait 2000; Sen and Banerjee 1988; Chanda *et al.* 1996). This work is aimed to relate climatic changes and landscape evolution with human cultures in this region. Preliminary field observations were made to evolve a methodology with which to understand fluvial and flood processes and to reinterpret the evolution of the landscape in terms of climatic changes, fluctuations in sea-level and autochthonous changes associated with the fluvial system along with neotectonics in relation to archaeological cultures.

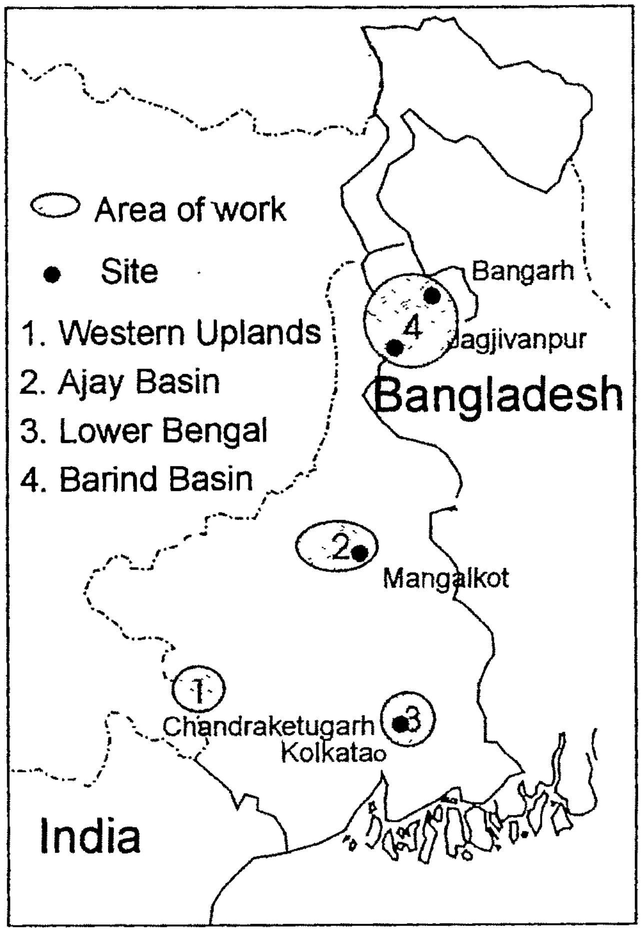


Fig. 1: Location of study area

Though the Western Upland areas of the Bengal Basin have been occupied by humans since the Middle Pleistocene, evidence for human settlements in the basin proper does not go beyond 4 kyr (approx.). Settlements occur from the Chalcolithic period in the *rahr* tract in Middle Bengal (c. 1100-700 B.C.). In the Early Historic period (300 B.C.-200 A.D.) settlements occur in parts of South, Central and North Bengal while during the Early Medieval period (500-1000 A.D.) the whole of the basin was populated (Fig. 1). Despite the work done on palaeoclimates in the Bengal Basin there has been little effort to relate it to past human cultures of the region. It was with this background that a beginning was made to understand the relationship of the archaeological sites in this area in relation to changes in past landscape and climate. The regions covered include 1) The microlithic sites in the Western Uplands, 2) Chalcolithic settlements in the *rahr* region (Ajay Basin), 3) Chandraketugarh, Early Historic site in South Bengal and 4) The Early Medieval settlements in the Barind uplands in northern part of West Bengal.

Methodology

As archaeological sites in the area under study are situated in the flood plain context, it was necessary to understand the flood plain morphology that includes features like sand bars, levees, oxbow lakes, palaeochannels, swamps and marshes. First a reconnaissance survey of the region was undertaken with the help of detailed and exhaustive maps prepared by the Geological Survey of India. The surface surveys and section studies were then cross-checked with the help of satellite images (mainly PAN images) and available geological literature on the region. The archaeological geology was then studied on the basis of detailed soil stratigraphy and landscape morphology, absolute and relative. The flood plain is generally flat and primarily consists of silts, clays and fine sands. This basin also preserves organic rich dark coloured clays in localized swamps and marshes, generally formed as a result of acutely meandering streams and subsequent development of oxbow lakes. Therefore, these paleoswamps and marshes are the most potential geomorphic locations for collecting datable materials. Accordingly organic rich sediments were collected from swamps and marshes for radiocarbon dating to understand past migratory pattern of rivers. Based on this information detailed maps of fluvial deposits in various river valleys will be drawn up in the future. We also tried to study relict and buried soils developed over alluvial sediments of different ages as well as buried soils below the archaeological habitational and structural mounds in order to relatively date changes in the fluvial terrain. There was also an attempt to date relatively younger geomorphic features using archaeological mounds as a minimum age marker. Limited laborartory studies were carried out with sediments from Chandraketugarh in South Bengal and Jagjivanpur in North Bengal. Field survey was carried out with this methodology in mind in these three zones to understand the palaeolandscapes and past environments around these ancient sites.

The Western Uplands during the Late Pleistocene (Figs. 1-2)

Stone Age cultures of West Bengal have only been preserved in the Western Upland region, the non-alluvial part of the Bengal basin. Numerous workers have carried out archaeological work in this region but little was done on the geomorphic context or past environment and climate associated with the sites. Accordingly investigations were carried out in the Tarafeni valley, Northwest Midnapur, West Bengal to make a systematic study of the Stone Age remains of the region in relation to the local geomorphology and paleontology. Earlier workers reported sites ranging from the Lower Palaeolithic to the Neolithic age (Ghosh 1961, 1962; Datta *et al.* 1984; Chakrabarti and Chattopadhyay 1984; Datta 1991) (Fig. 2). Microlithic sites were previously reported from the districts of Purulia (Chakrabarti *et al.* 1983) and Western Birbhum (Chakrabarti *et al.* 1978-79) which form a part of the

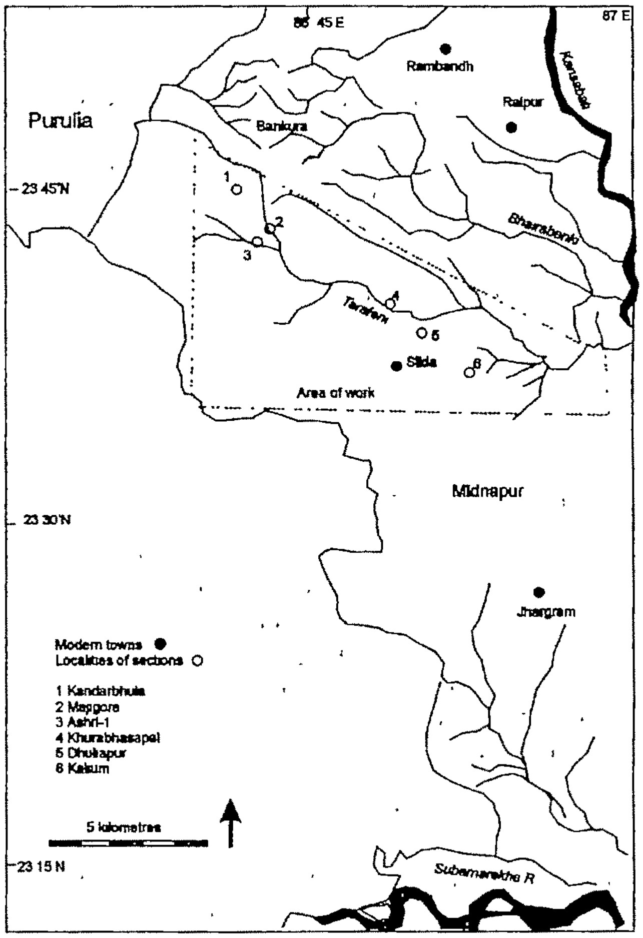


Fig. 2: Map of Tarafeni Valley

Chotanagpur Plateau in Bengal. Small excavations and trial pits were undertaken at Birbhanpur (Lal 1958), Paruldanga (Chakrabarti *et al.* 1982) and Kattara in the Tarafeni valley (Datta 1991).

Three phases of field survey were undertaken during 1993-95 in which several microlithic sites were found. Preliminary observations revealed that these sites were associated with colluvial gravel consisting of pebbles and granules of quartz, blocks and chips of schist and slate, and ferruginous pellets. In most cases this was seen to overlie pedogenic calcrete. The calcrete is part of the Sijua Formation, which primarily consists of fluvial brownish/ greyish sands, and loams. The pedogenic calcrete is overlain by decalcified brownish sands and loams, forming the highest (+ 10 m) terrace of Late Pleistocene/Early Holocene age. Vertebrate fossils were collected from the surface of this calcrete at Dhuliapur, the type-site in this region. Though fossils were reported previously (Ghosh and Majumdar 1981, 1991) their association *vis-à-vis* the geology and archaeology was not clearly defined. The formation of a pedogenic calcrete zone in a sub-humid region with an annual rainfall of 1600-2000 mm is very significant from a larger environmental perspective. The distribution of calcrete is more wide spread in the drier parts of the world with limited precipitation (Reeves 1976; Goudie 1983). The humid limit to calcrete distribution varies from area to area but generally it lies in the zone where the annual precipitation is between 400 and 600 mm (Goudie 1983). In India calcrete is found in the semi-arid tracts of Rajasthan, Maharashtra, Gujarat and North Karnataka where the annual precipitation is less than 700 mm and where the evapo-traspiration ratio is very high.

The presence of pedogenic calcrete in this region and its association with fauna and microliths prompted a preliminary study of this unit of the Sijua Formation (Basak *et al.* 1998).

During the 1993-95 field seasons six sections were documented for understanding the stratigraphy of the microlithic sites in the area. The section at Dhuliapur was taken as the Type Section as it showed the most explicit evidence of the association between the microlith-bearing colluvium and the fossil-bearing calcrete. At the base of the section a 2 m thick moderately consolidated gravel is exposed, designated as Upper Lalgarh Formation (Ghosh and Majumdar 1981, 1991). This gravel is capped by yellowish clay (20 cm thick) which is overlain by a 2.5 m thick brownish yellowish silt. The top of this silt is overlain by a 40 cm thick calcrete horizon. The calcrete is further capped by a 1.2 m thick reddish brown silt, the surface of which forms a terrace in this area. The microlith-bearing colluvial gravel is found to grade imperceptibly with the calcrete laterally within a distance of about 50 m. This shows that the calcrete and the colluvial gravel have formed more or less simultaneously. The trial pits taken at the other five sections reveal an almost similar stratigraphy (Fig. 2).

The collection from Dhuliapur comprises fairly well preserved dentition and postcranials of medium sized mammals like *Axis axis* (spotted deer), *Antilope cervicapra* (blackbuck) and *Bos namadicus* (extinct cattle). These are principally grazing animals and have been also found from other parts of India. These species range from Middle Pleistocene (for *Bos namadicus)* to as late as Early Holocene. For *Antilope cervicapra* it can be suggested that this species originated in India itself about 35,000 years back as dated by radiocarbon method. Das Sarma *et al.* (1982) have identified these species along with a few others from several river basins in parts of Bankura, Burdwan and Purulia districts of West Bengal (which are situated north and north west of the present area of investigation) and have assigned them to Late Pleistocene-Early Holocene.

Forty-seven microlithic sites were mapped of which twenty-five were previously reported. All the sites are located on the banks of the Tarafeni river or its feeder channels. The total area of investigation covered by these sites is 450 km^2. The major sources of raw material like chert, chalcedony, metabasalt and quartzite used in the manufacture of stone tools could not be found in this region, but were traced at 25 km away to the west. An attempt was made to look at the processes of raw material procurement, manufacture, use, maintenance and discard of tools from a study of the assemblage at the various sites. Subsequently, certain ideas of past strategies and plans of land use adopted to cope with the environment in a particular context were thrown up, incorporating similar archaeological and ethnographic studies on hunter-gatherers done in other parts of the world.

Several bones were analyzed for fluorine/phosphate ratio (Kshirsagar and Gogte 1990) which is an indicator of their relative age. The majority of bones collected from the surface of the calcrete give F/P value of 3-5, supporting the dating of the Formation to the Terminal Pleistocene (Kshirsagar and Badam 1990).

Soil samples of the unit (of yellowish/reddish brown silt) capping the colluvium and the calcrete were collected from a select sites and subjected to textural analysis by the standard pipette method. A depth-wise analysis of sand, silt and clay of the three samples was done. The chemical analysis of the yellowish brown silt indicates that it has a high proportion of SiO_2. Therefore, it is not derived from lateritic exposures but has originated from oxisols, which are slightly acidic and without any trace of carbonate. The textural composition suggests that the silt was deposited as flood loam during the sheet floods in the Tarafeni valley in the Holocene. This flood loam has undergone pedogenesis as indicated by the development of blocky pedal structure and by the occurrence of a high proportion of clay in the upper part of the profile. The chemical analysis of calcrete samples has revealed a carbonate content of 61-67%.

The Terminal Pleistocene (10-18 kyr) coincides with the maximum extension of most of the continental ice sheets when a cold dry climate prevailed in most parts of the world. Evidence of aridity has been documented from North and West India where the present climate is arid to semi-arid, but such evidence is all the more striking when it relates to the humid to sub-humid regions of Eastern India, as in Meghalaya, Manipur, Mirik Lake, Darjeeling and the South Bengal basin (Singh 1987; Chanda and Bhattacharya 1987; S.C. Chanda personal communication). The lower salinity gradient of the Indian Ocean (Duplessy 1982) and a low sea surface temperature in the Bay of Bengal and over much of the Indian Ocean (Prell *et al.* 1980) during the same period provide additional evidence for Late Pleistocene aridity.

The calcrete formation of pedogenic origin suggests a semi-arid phase. Calcrete does not form in a climate presently humid climate (1600-2000 mm) of Midnapur. The post-microlithic oxisol capping the colluvium and calcrete is typical of a weathering horizon in a sub-tropical humid environment. A semi-arid environment generally characterized by soil stripping, seasonal rainfall after long dry spells would be associated with grassland ecosystem. The fossil evidence for grazing species found from Dhuliapur supports this argument. All these species have been also found from archaeological and palaeontological sites in other parts of the country, dating to the Late/Terminal Pleistocene. The microlithic sites are therefore correlated to a semi-arid Terminal Pleistocene on the basis of the stratigraphy drawn up at the six major sites where no perceptible time gap was noticed between the deposition of the microlith-bearing colluvium and the calcrete horizon underlying it.

Similar observations were made in the foothill region of Ayodhya Hills, Purulia District, northwest of Tarafeni valley. Microlithic sites found in this region currently form the subject of an ongoing project (Basak 2001). Although some of these sites were discovered before, their context was not studied properly. On the basis of field observations the microliths are uniformly associated with a colluvial layer which, here too, is a dramatic interlude between two phases of aggradation as represented by a pre-microlithic and post-microlithic pedogenised units. The only difference between this and the stratigraphy observed in Tarafeni valley is that calcrete has not developed as a profile here. Rather calcrete development is incipient and only concentrated in some places as lag deposits. This is due to the fact that the foothill region is an unstable surface unsuitable for such developments. In spite of this absence, the colluvial layer may be related to aridity in the Last Glacial Maximum on the basis of supporting evidence from Tarafeni and similar influx of colluvial deposits in Manipur. A detailed multi-disciplinary analysis of these lithological units needs to be undertaken by taking trial trenches at a few sites and using advanced techniques like luminiscence, mineral magnetic dating and geochemistry.

Chalcolithic Settlements in the *rahr* region (Ajay Basin)

The Ajay Basin covers the *rahr* region in Middle West Bengal where archaeological sites date from the Chalcolithic period onwards. The river originates from Saran in southeastern part of Chakai Plateau of Chota Nagpur hill track and flows eastwards into the Bhagirathi catchment. The river Kunnur is one of the principal tributaries of the Ajay. Three geomorphic surfaces of Ajay river valley — (a) Illambazar Surface (b) Notunhat Surface (c) Katwa Surface occur in the present study area (Roy *et al.* 1998). The Illambazar surface, is a combination of older alluvial terrace along with weakly ferricritised sand and gravel Formations. Most of the Chalcolithic or Black-and-Red Ware sites, reported in the Ajay Basin, are located on this surface. This landform comprises thick, compact brown sand and sandy loam and is very favourable for agricultural production. Among the major sites are Pandu Rajar Dhibi (dated between 1100 and 700 B.C.) (Dasgupta 1965), Basantapur, Rajar Danga, Ganga Danga (Dasgupta 1965), Deuli (IAR 1964-65) and Supur (Dasgupta 1965). The alluvial tract begins with the Notunhat surface. It is a moderately dissected alluvial tract covering the highest grounds above the occasional and usual flood level in the alluvial landscape of the Ajay valley. On this landform the number of Early Historic sites outnumbers Chalcolithic sites. It provided favourable environment for agriculture and riverine trade is indicated by the large number of Early Historic settlements. These two rivers create two different types of environment due to their differential flooding, erosional and depositional activities. River Kunnur has less impact on sites, as it is stable except during the monsoons when occurrence of flash floods and bankful discharge leads to flooding of the banks. On other hand, the river Ajay affects settlements to a greater degree as most of them are found buried under a cover of thick alluvium and seasonal floods erode the settlements every year. Sites like Mangalkot (Ray and Mukherjee 1992), Sagira, Kogram are located on this landform. The next lower bench i.e. Katwa surface is the terraced alluvial landscape, which represents the oldest part of the flood plain of the Ajay and its tributaries. This landform has the largest concentration of Early Historic sites. Sites like Katwa, Bikehat (IAR 1975-76), Ketugram (IAR 1975-76), Nabagram and Jajirgram have yielded Early Historic as well as medieval cultural materials. This area is characterised by the presence of low energy pedogenised hydromorphic soil, which helped in development of sites in later periods also. The lowest topographic bench in this basin is the meander belt of the Ajay, the Diara surface. In this belt the depositional

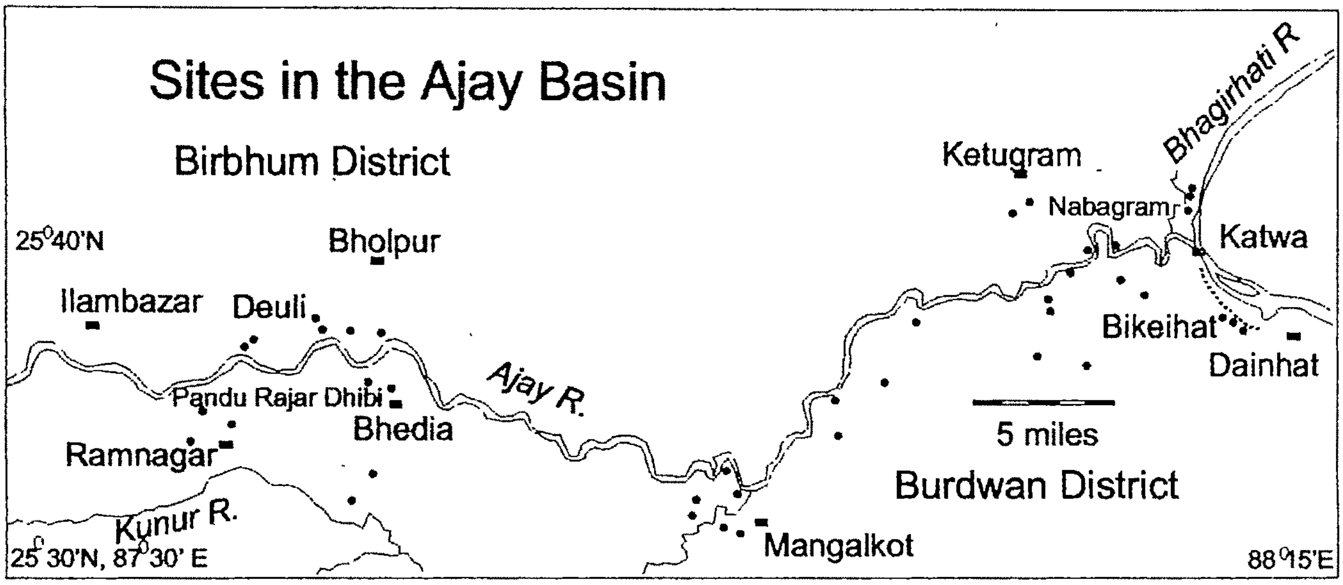


Fig. 3: Distribution of sites in the Ajay valley

landform elements are still in the process of formation and stabilization. The younger alluvial fill is weakly pedogenised and less compact without the presence of iron-manganese pellets and mottling. Both the older and newer alluvial fills are dominated by low energy floodplain facies and the latest (post-Late Medieval) flood plain facies is composed of sand. The latter represents occasional strong sheetfloods in which sands are deposited.

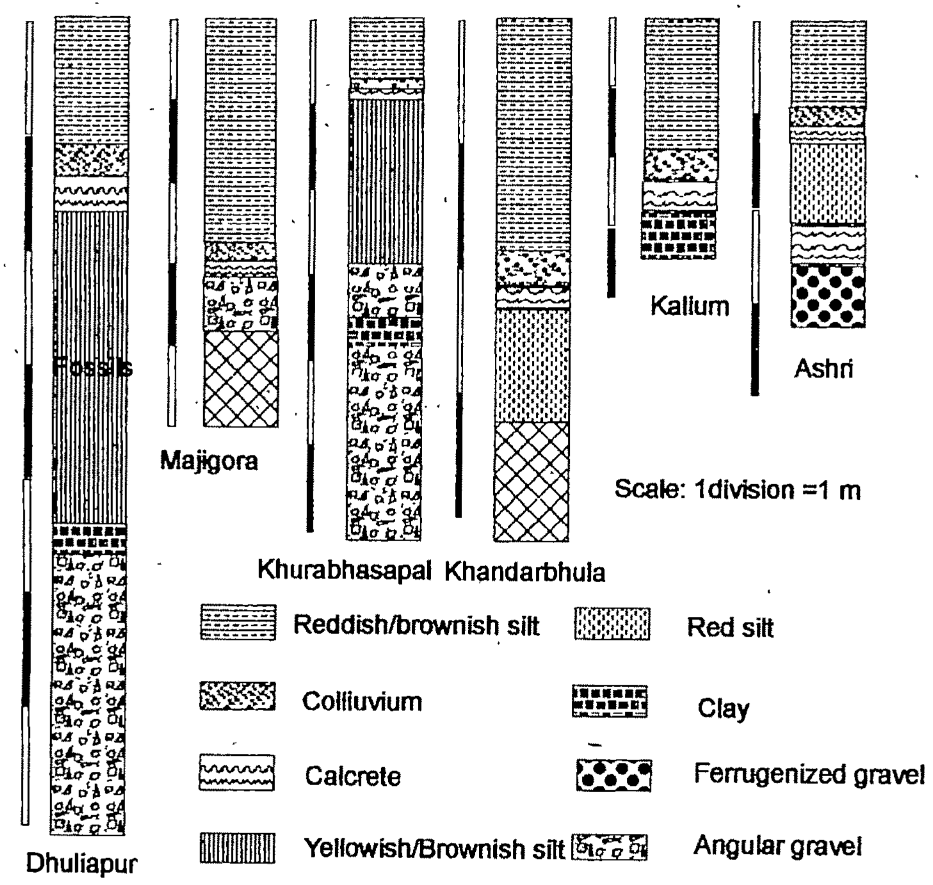
The Ajay Basin is primarily an alluvial landscape of Mid to Late Holocene age (3-7 kyr). It has preserved cut and fill terraces 3-4 m above the modern channel of the Ajay river. All the riverbank sites are buried under thick layer of alluvium. The habitational blackish (ashy) layer contains the occupational debris capped by alluvial silt. In many cases the river bank sites contain mixed assemblages of ceramics, which makes it difficult to assign an archaeological age to them. These buried sites are regular features of the flood plain. When the rate of sedimentation is faster than the rate at which habitation on the site builds up the site eventually gets buried.

In the Ajay Basin (Fig. 3) survey at the site of Pandu Rajar Dhibi revealed a layer of buff sandy silt overlying Period-I cultural layer, thus indicating that the site was abandoned due to the floods of river Ajay. The site is away from present position of the river showing that it has shifted to the northwest.

The site of Deuli is situated on the Ajay flood plain. It yielded Black-and-Red ware along with Early Historic ceramics. A well-preserved younger alluvial fill in the form of greyish clay, i.e. low energy stagnant water flood plain, is partly exposed on the present bank of river Ajay. The alluvial fill comprises medium to coarse sand. The archaeological layer is purely in secondary context as indicated by the occurrence of reworked Chalcolithic, Early Historic and some Medieval pottery. This archaeological layer is found to be capping the moderately pedogenised alluvial fill. The actual site is inside the village near a temple mound, which is as yet unexcavated. The archaeological layer is 3 m above the present channel and 1-1.5 m below the present surface. This indicates that the gradient during the Chalcolithic and Early Historic times was gentle. The greyish fill which is non-oxidized without mottling and containing ferric and manganese pellets is therefore a younger fill probably not more than 200 to 300 years old. However, it indicates that the settlements are situated on the older terrace, which was a stable landscape.

The most interesting section was noticed in the Katwa surface, at the site of Nabagram (Fig. 4a) lying on the meandering loops of the river Ajay where it has formed abandoned channels and backswamp areas. The site of Nabagram bears Early Historic deposits, but it was disturbed by near channel overbank flooding during medieval times as indicated by the occurrence of medieval potsherds in overlying flood silts and sands. At this site a gradation from dark greyish clay at the bottom to strongly oxidized clay in the upper part is observed. There is a good development of mottling and iron and manganese pellets. It therefore, appears that this fill has preserved sedimentary history related to sea level changes and Holocene tectonics. The older fill is, however, capped by an Early Historic layer rich in ash and charcoal, which is capped by yellowish silty sand, weakly pedogenised, containing redeposited potsherds. This indicates initial water saturation and a high level of groundwater stagnation, thus indicating a more

Sections from the Tarafeni valley



Sections from Bengal Basin

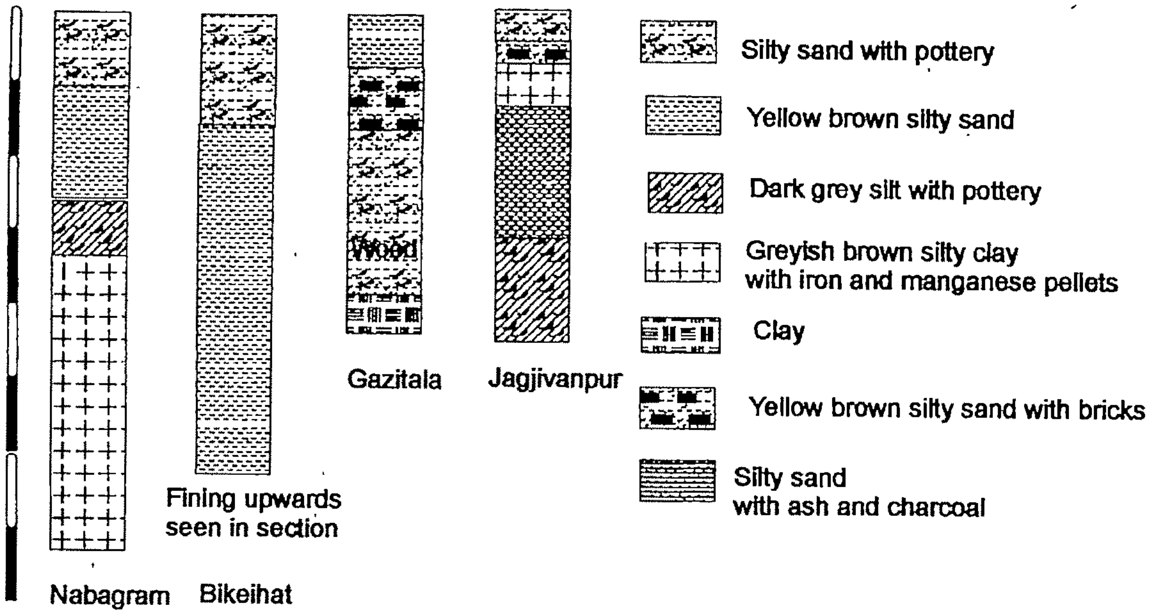


Fig. 4: Sections from Tarafeni valley and Bengal Basin

stable landscape earlier. The dark colour of the habitational layer is due to retention of moisture of older flood plain sediments. It seems that during this time the river was probably flowing away from the site so that pedogenesis dominated over sediment deposition. During this time an Early Historic settlement had developed and had experienced low energy hydromorphic soil Formation. The settlement is on a terrace and probably the channel of active stream was far away and slightly lower than the present one probably around 2 to 3 kyr. This shows that Ajay river was a slow anastomosing river in historic times.

The site of Bikeihat (Fig. 4b) lies very close to the confluence of Bhagirathi and Ajay. This large site has yielded Early Historic to Medieval cultural deposits on an alluvial terrace surface situated 3 km away from the present surface of Bhaghirathi. This fill is weakly pedogenised as indicated by crude lamination and without any conspicuous development of pedogenic concretions. However, the undisturbed cultural material suggests less flood effects on the settlement. It also shows no significant time lapse between the Early Historic settlement and the Formation of the flood plain, which probably dates back to Mid Holocene to Late Holocene. This is the only site of the Early Historic period, which is associated with the near channel environment of the Bhaghirathi. Thus, the settlement is on a relatively younger alluvial surface without any obvious flood effects.

The three geomorphic surfaces in Ajay valley, i.e. the Illambazar, Notunahat and Katwa surfaces, have preserved a long human history along with the history of climatic change and river action. The Illambazar and Notunhat surfaces have provided the most stable landscape for the primitive Chalcolithic agriculturists while the Katwa surface along with the former surfaces was occupied only in the Early Historic Period. Most of these sites were affected by low intensity floods known as "nuisance flood" (Brown 1997) which did not devastate the settlements. So, the sites were occupied and abandoned time and again while the landform building process was still going on. Such an anastomosing river system was possibly noticed during the Mid Holocene to Late Holocene. The Chalcolithic to Early Medieval settlements, therefore, were associated with flood plain environment rather than an incised channel with sandy banks. The Ajay changed into a high energy fluvial system in the Late Medieval period as the disturbed cultural deposits of this period indicate a high energy flood, which might have occurred around 200-400 years ago. The sand accretions in the channel of Ajay and near channel sand bar or levee development are the latest phase of the Ajay and are post-Medieval in age. It is this sandy deposit, which has buried archaeological settlements associated with the flood plains of the Ajay river.

Chandraketugarh

Work was also carried out at Chandraketugarh (22° 41' N, 88° 42' E) in South Bengal in the District of North 24 Parganas, northeast of Kolkata. Excavations at this site revealed that it was occupied from the Mauryan to the Pala period (IAR 1955-56 to 1965-66). The site (Fig. 5) is situated on the moribund delta of Ganga-Brahmaputra river system. The drainage of the area now constitutes semi-perennial channels, which are fed by run-off in the monsoon. The rivers in this area are Bidyadhari and Padma Nala (which is a part of Ichchhamati River). They are now both disconnected from the Bhagirathi channel. The rivers in this region are fed by surface run-off of the rainwater and tide. The region has many marshes and shallow lakes locally known as *bils* which originated from backwaters and oxbow lakes and contain more water than the parent channel. The terrain is at all points less than 10 m above sea level. The Bethuadahari surface is the oldest and the highest surface of the region followed by Katwa surface. These two are higher than the present flood level. The youngest and the lowest is the Bhagirathi surface, which is the active flood plain. The area is scoured by palaeochannels that suggests a lot of lateral movement of the rivers. The site itself is situated on the Katwa surface on the eastern bank of a palaeochannel and southern bank of another palaeochannel. On the basis of the survey carried out by Geological Survey of India (Fig. 6; personal correspondence with Senior Geologist A.K. Banerjee) it is clear that the site is situated on varied geomorphic features: palaeo-levee, palaeo-backwaters and palaeo-pointbars. Archaeological survey in this area revealed (Fig. 7) that the structural mound, Khana Mihirer Dhipi dates to the Early Medieval period. From the exposed sections it is clear that the Early Historic alluvial horizon is at present buried under the alluvial deposition of the later times and would not be exposed unless there is human intervention. Village to village survey around Chandraketugarh showed that only two sites are present near the main settlement — Mochpol to the northwest and Gopalpur to the southeast, both existing on palaeochannels. The other sites include Deulpota and Harinarayanpur on Bhagirathi; Boral and Atghara on Adi Ganga. All these ancient settlements are located along the course of the rivers. Chandraketugarh is the largest site of this region with area of about 4 km^2 occupied during the Early Historic period. Atghara and Harinarayanpur have very impressive material remains belonging to the Early Medieval period but the remains of the Early Historic period are comparatively scanty. Some are so small that they cannot be traced. None of these sites have any satellite settlements. Geoarchaeological work was carried on for two seasons between 1998 and 1999 around the site of Chandraketugarh, and the adjoining area was explored and observations were made on a number of pits recently dug by local people at the locale of Gazitala. These pits reveal dark greyish clay silt rich in potsherds,

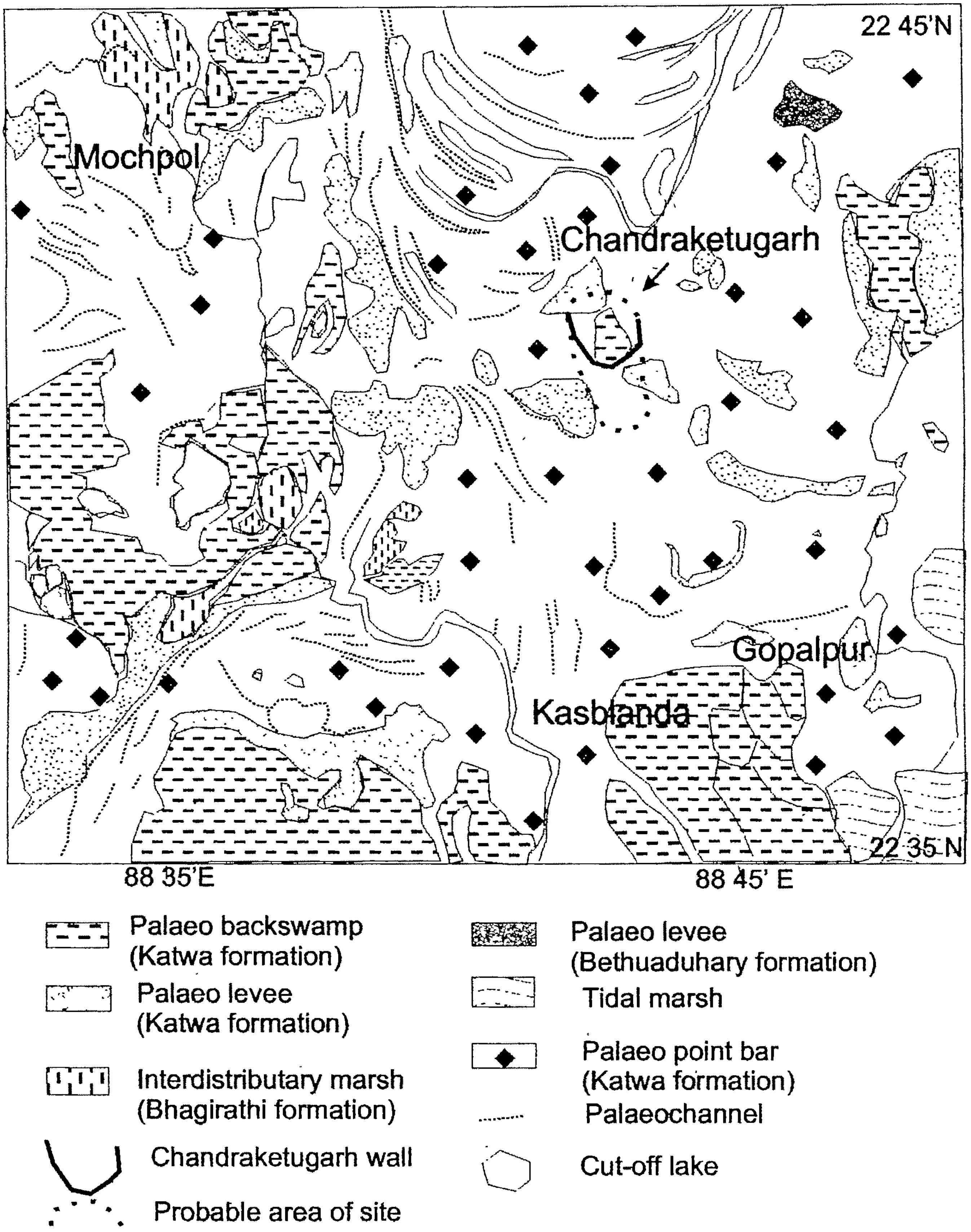

22 45'N
Mochpol
Chandraketugarh
Gopalpur
Kasbanda
22 35'N
88 35'E
88 45' E
Palaeo backswamp (Katwa formation)
Palaeo levee (Katwa formation)
Interdistributary marsh (Bhagirathi formation)
Chandraketugarh wall
Probable area of site
Palaeo levee (Bethuaduhary formation)
Tidal marsh
Palaeo point bar (Katwa formation)
Palaeochannel
Cut-off lake

Fig. 5: Geomorphology of Chandraketugarh

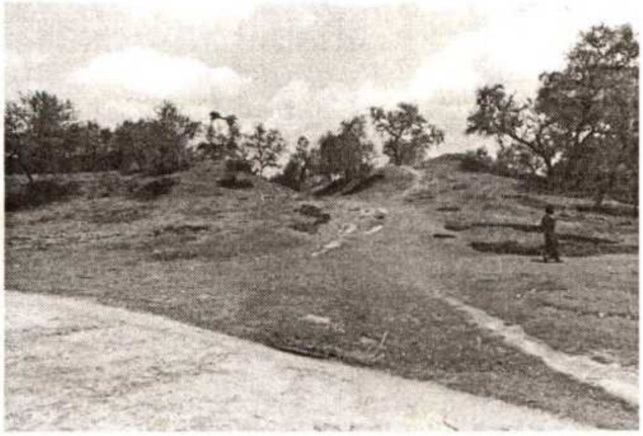


Fig. 6: Rampart walls at Chandraketugarh

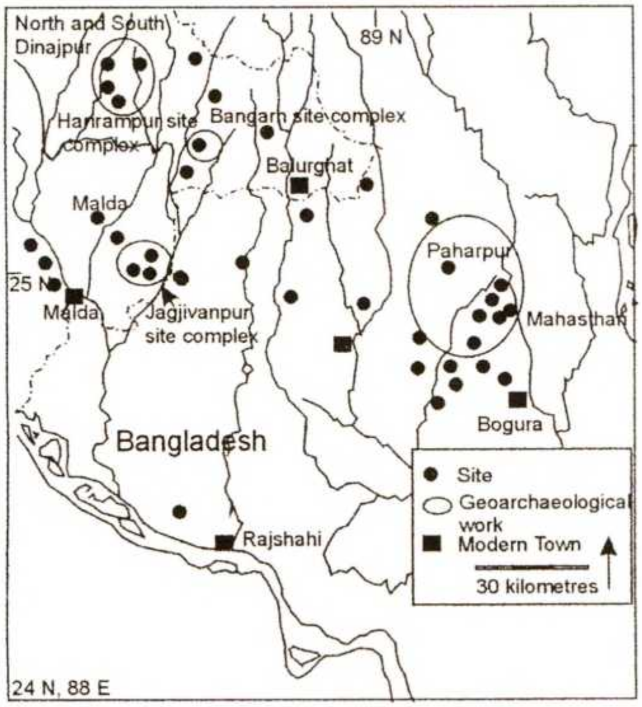


Fig. 7: North Bengal: area of work

terracottas and other artefacts dated to the Early Historic period (3.1 to 4.2 m below the surface). Silty sand (10 to 20 cm thick) yielding fragments of driftwood overlie this dark silt, which were collected for radiocarbon dating.

The sections exposed at points in Gazitala region revealed that the Early Historic habitation lies 3-4 m below thick silt. The stratigraphy of the two sections is given in Figs. 6 and 9 and the results of chemical analysis in Table 1 and 2.

Table 1: Results of chemical analysis

Layer	pH	% Organic carbon	% Organic matter
1	6.8	0.241	0.416
2	7.47	0.157	0.270
3	8.01	0.210	0.362
4	7.56	0.136	0.235
5	7.59	0.577	0.996
6	7.04	0.577	0.996

Table 1 shows that the layers that do not contain pottery are also low in organic matter. It is moderate in the top layer, which contains pottery. In the last two layers, which are dark grey in colour, the organic content is again high. A similar phenomenon was also noticed in section 2. The pottery from the section in layers 5 and 6 belongs to the Early Historic period.

Table 2: Results of chemical analysis

Layer	Munsell Colour Chart	pH	% Phos-phorus	% Organic carbon	% Organic matter
1	Pale yellow (2.5YR 7/3)	8.2	0.19	0.294	0.506
2	Light grey (2.5YR 7/2)	7.9	0.15	0.365	0.633
3	Dark grey (2.5Y 4/1)	7.5	0.23	1.512	2.606
4	Light brownish grey (2.5Y 6/2)	8.4	0.087	0.294	0.506

The section exposed at Chandraketugarh that a part of the habitation, in spite of the alluvial nature of the deposition, is attested by the phosphorus content of the samples from different layers. Except for the last layer all of them gave positive results. The last layer is a clayey lens, which seems to be a local stagnant water deposition. Another section at the site (Shanpukur) showed that 50 cm of grey silt was found followed by a sandy layer 1m thick below

Fig. 8: Paharpur Stupa, Bangladesh

Fig. 9: Mahasthan, Bangladesh

which Early Historic pottery was found in the dark grey layer. Sections studied in other areas around the site gave similar results except Deolpota near Diamond Harbour. Here the top layer which of weakly pedogenised sandy sily or silty sand with Medieval bricks is followed by a greyish silt containing Early Historic pottery. The exploration and the study of the sections clearly indicate that Chandraketugarh and other Early Historic sites of this region are buried sites. As such, "mounds" are not to be found in this region at least for the Early Historic period. From the exposed sections it is clear that the Early Historic alluvial horizon is at present buried under the alluvial deposition of the later times and would not be exposed unless there is human intervention. Exception to this is Harinarayanpur where channel erosion is the cause. The buried sites are features of an active flood plain as referred to in the Ajay valley. Data from Dankuni, which is very near the site, revealed that between 7000-3000 B.P., the surface has risen by 15 m while in the next 2000 years the rate of agradation is much slower – about 2-3 m, i.e. 10 to 15 cm/100 yrs (Chanda *et al.* 1996, 1999).

The ancient landscape around Chandraketugarh had much more vegetation cover, river systems were without large dams and the channel depth and velocity of water was low. There is no littoral or tidal deposition at this site which indicates that it was not near the sea and far from its saline influence. The settlement developed into an urban centre in response to the prospects of trade. The linear pattern of settlements emphasizes the importance of the rivers that acted as channels for communication. The analysis shows a very small proportion of sand in the alluvium suggesting that the region experienced very low intensity floods. At Chandraketugarh, the presence of Early Historic pottery in unoxidised dark grey silt suggests that the site was flooded regularly. Due to these frequent floods though most urban centres of the period had brick built structures, Chandraketugarh had mud houses. The settlement started, continued and was abandoned when the landform building process was still on. The section at Gazitala clearly shows that the levee building process had already started in the Early Historic period. The site was probably inhabited first at the place now occupied by the Berer Bil (a palaeo-backwater). The Gazitala section suggests that the burnt brick structures appear only after the silt was partially oxidized. This in turn suggests less frequent floods. It seems that in the Early historic period the river channel was highly sinuous and probably anastomising. It was only in the Medieval and later times that the channel became less sinuous and slightly entrenched with the development of sandy levees, bars and shallow flood plains. These changes were also noticed in the nature of sediments in Ajay valley as well as in the Barind region during the Late Holocene.

Barind Region of North Bengal

Work was also carried out in the Barind area of North Bengal, which falls, in the sub-humid region of West Bengal. The presence of older deposits of the Pleistocene age to the north of Malda town at the base of the Mahananda- Tista conjugate fan constitute a distinct upland feature, known as the Barind Upland. The migration of rivers is one of the wide-spectrum of responses that have led to environmental changes in the past. The Quaternary stratigraphy of the area was initially developed by the Geological Survey of India (Das and Panja 1999) which was supplemented by fieldwork carried out by the authors. Our observations show that the Barind, Older Baikunthapur, Younger Baikunthapur and Shaugaon surfaces represent the overall terrace morphology of the area. The Barind is a ferrugenized flood plain without calcrete development and with incipient ferricritization. The Older Baikunthapur (OB) formation shows two variations as far as its pedological characters are concerned: Calcretized with excellent development of calcrete nodules 2.5 to 3 cm in size and non-calcretized and resembling the Barind formation particularly in its upper 1 to 1.5 m.

Following the methodology outlined earlier, selected major archaeological structural-cum-habitation sites were taken up for detailed observation and study in the Barind region in North Bengal.As part of this preliminary survey we observed the relict or buried soils and sediments below a few archaeological sites (Bangarh, Jagdalla/Mahator, Kandaran, Ranigarh and Jagjivanpur) to understand the geomorphic context of these sites as well as the landscape at the time of their original occupation.

The very large site of Bangarh, dated to the early Historic to Medieval times (Goswami 1948) is situated on the Older Baikunthapur formation near Gangarampur on the banks of the Punarbhabha. Our survey in this area showed that the Early Medieval brick ghats went right into the present riverbed. From a local schoolteacher, we got borehole data. It shows that 5 to 6 m thick archaeological debris was underlain by 6-24 m greyish yellow limonitized clayey silt with alternating sand and mottled clay between 24-32 m with sand below this layer. At another point there is a convincing evidence of flood deposit (greenish-grey clayey silt) sandwiched between Late Medieval and Early Medieval settlements. These field observations suggest that the Historic and Early Medieval habitation was situated on a limonitized flood plain terrace when the channel was at least 7-8 m below the present level. The site came under flood danger only during the last phase of the Early Medieval habitation as evidenced by flood deposits in many parts of the site.

The sites of Jagdalla and Mahator, both dated to the Early Medieval period, are situated north of Harirampur near the Cheeramati nala. We exposed a small pit on the left bank of the nala near the site of Jagdalla. The mound rests on coarse sand-clay alternations showing that the channel sand is overlain by reworked habitation debris and resulted as colluvium in the process of mound degradation after 400 B.P. A little downstream (0.5 km) we found a palaeo-swamp by the side of the road older than the reworked habitational debris. It is probably older than the Late Medieval habitation and younger than early habitation in this area. The channel sand and the swamp clay are probably contemporary. Radiocarbon dating of organic debris from this swamp will add additional inFormation. At Mahator further downstream, channel sand yellowish grey in colour occurs below (0.5 m) the base of the habitational debris (as reported by the local people and as seen in the road cutting). The paleochannel can thus be said to be probably contemporary with the Early Medieval habitation.

The Early Medieval site of Jagjivanpur situated near the Punarbhabha river is being excavated by the Directorate of Archaeology, West Bengal (Ray 1992). The section below the structural mound in the northeastern corner of the site was exposed by the authors. The section shows that the site is situated on Younger Baikunthapur formation consisting of clay rich flood plain facies affected by hydromorphic gley soils. The section reveals three major buried ferruginous soils developed over greyish clayey silts in between. The ferrugenization has developed relatively fast due to the easy supply of iron oxide minerals derived from the nearby ferrugenized Older Baikunthapur formation. The site is situated on the flood plain deposits of the Punarbhabha river and have preserved evidence of partial exposure to the atmospheric conditions probably suggesting lowering of channel or groundwater level in this area. During the deposition of these sediments, the river was flowing away from the site of structural activity.

The first human activity took place when the area was part of a semi-active flood plain. This activity became less probably because people thought it to be not suitable for erecting brick structures. Later this flood plain became less active and was exposed to pedogenesis for some time. This exposed flood plain surface formed the activity area for the Early Medieval monastic population who constructed brick structures on this stable flood plain surface. The excavator observed a thin lense of ash silty clay sandwiched between the habitational debris of the structural mound. It probably represents occasional but very intense flood activity of the Punarbhabha river. Throughout this activity the main channel was probably away and was flowing at a lower level than the present one as we get flood plain deposits very close to the present active sandy channel which continue below it (as reported by the local people). Lateral migratory system and groundwater lowering are responsible for the changes that we observe in archaeological and non-archaeological sediments in the trench.

The site of Kandaran is situated on the Older Baikunthapur formation where there is evidence of channel migration.

Observations were also made between Malda and Jagjivanpur in Malda District particularly on the Mahananda. The area 10 km upstream of Malda (on the Malda-Aiho stretch) showed levee development during the last 200-250 years and also revealed a buried flood plain with a 250-300 year old settlement.

This methodology was used further to understand the landscape more comprehensively by carrying out geoarchaeological fieldwork in Bangladesh in March 2000 with the help of the Department of Geology, Rajshahi University. The aim was to make observations on the Quaternary stratigraphy and environment in the Northwest part of Bangladesh as an extension of the work in North Bengal on the Barind surface. The Holocene surface around Rajshahi and its relationship with the archaeological sites like Mahasthan and Paharpur was also studied.

Previous work has been carried out by Alam (1998) on the palaeosols of the Barind surface (20-40 m AMSL and about 200 km north of the present coastline of Bangladesh with present mean rainfall of about 1500 mm per annum, mostly from southwest summer monsoon). Based on different field criteria, buried soils were recognized in the Pleistocene deposits. Both moderately developed and strongly developed palaeosols occurred in cyclic successions indicating alternating dry and wet climatic phases. The cyclical climatic variations were reflected too in bulk magnetic susceptibility and stable isotope signatures in the palaeosol sequences that can be related to the strengthening and weakening of the palaeo-summer monsoon during the Pleistocene. These events were also evident in the Holocene sediments.

Observations showed that the undissected Barind surface is underlain by multiple ferruginous soils (oxisol group) developed with varying degrees of soil development (mature to moderately developed) on primarily deltaic low energy greyish sediments (silty clay to clayey silt with minor amount of fine sand). In paleoclimatic terms, rainfall rarely went down below 1000 mm in the major part of the Quaternary history of the region. The only period when the rainfall appears to have gone to as low as 760 mm per annum is dated to the Late Pleistocene (roughly from around 10 to 15 kyr). In short, the Barind surface has well preserved palaeosols indicating drastic climatic change in the form of semi-arid climate during the Late Pleistocene in the presently sub-humid parts of NW Bangladesh.

A section on the bank of the Ganga near Sarangpur (left bank of Ganga at Godagari) represented an interesting early-mid Holocene history of the delta building activity. The section shows a distinct erosional phase before the Holocene fill which shows earlier flood plain development with some stability as indicated by moderate pedogenesis and later levee development. In the Ganga valley (near the present area of work), a similar alluvial section has been ^{14}C dated (on organic material and freshwater shells) to 7-2 kyr personal communication by S. Alam). On our way to Mahasthan-Paharpur we could examine a few palaeochannels (sand bar, levee, etc.) in recent cuttings by the side of the road. We found development of a 4 m thick channel fill within last 200-300 years near Badalgachi as revealed by a few redeposited Late Medieval potsherds in non-pedogenised cross-bedded medium to coarse sand rich in white and dark mica. Probably the channel fills with recent potsherds and swamp with organic debris could be contemporary process of the Late Holocene (younger than 300 years B.P.) delta building environment of NW Bangladesh. This type of modern sand bars 2 to 3 m thick exposed in the roadside cuttings only suggest a dynamic migratory nature of the mighty Ganga and its tributaries.

Therefore, we can conclude that in NW Bangladesh there was an overall humid climate (1500 mm at least) with fluctuations within sub-humid/humid phase (not reaching semi-arid phase particularly during early-mid Pleistocene). The Lalmai and Madhupur uplands indicate a similar climatic history in the eastern part of Bangladesh. There is very convincing evidence for a Late Pleistocene semi-arid climatic phase at least in NW Bangladesh. There was a rapid channel aggradation (4 to 5 m or even more) within 200 years in lower Ganga Basin suggesting a high degree of dynamism of delta building processes in the region.

It was with this background that we proceeded to understand the archaeological sites and their palaeolandscapes. We concentrated on the two most important sites, Paharpur (Dikshit 1938) and Mahasthan (Ahmed 1975). Paharpur (Fig. 8), the well-known monastic complex is situated about 46 km northwest of the site of Mahasthan and 48 km southeast of the site of Bangarh in South Dinajpur. A cutting exposed below the structural mound reveals that it is situated on either stable Barind sediments of the Pleistocene or a relatively stabilized flood plain or near channel facies of mid-Holocene age.

The Barind surface itself has undergone intermittent phases of strong erosion. The most interesting erosional phase was observed around Mahasthan, a huge site in Bogra District, which occurs on the stable, flat Barind surface developed over strongly developed ferruginous gleyed deltaic sediments of Early to Mid Pleistocene age on the bank of the laterally migratory river, Karatoya. This Holocene sandy alluvial fill (4 to 5 m thick) represents various migratory episodes of the river in the last 2000 years. Both the sites are on stable landscapes away from flood danger. Karatoya is naturally stable due to the presence of the Barind Formation, which prevents any further migration. The presence of a greater number of sites could be due to a more stable land surface in this area apart from other cultural factors.

A study of some of these sites shows that there is no uniformity in the pattern of flood effects on the sites. The sites were, however, not affected by severe flooding even though the flood effects varied with the differences in geomorphology. It was more in the nature of what has been described as "nuisance" floods as in the Ajay valley and Lower Bengal. Nevertheless these intermittent floods prevented the formation of numerous large urban centres or settlements. The landscape was dominated by small, ephemeral sites with few "bigger" structural mounds and habitation deposits located on elevated surfaces near entrenched channels free from flooding.

Two seasons of fieldwork established that Malda and Rajshahi responded more or less in the same way to Quaternary environmental changes that include neotectonics, climate and sea level changes. After studying the geomorphology of the area and buried soils beneath archaeological sites we came to the conclusion that in North Bengal the Tista-Mahananda conjugate fan is dominated by flood plain facies from Early Pleistocene to the Late Holocene period. Ferruginous, gley or hydromorphic soils dominated the landscape even during the Late Quaternary. During Early Medieval times, majority of the sites were close to flood plains having channels within the finer sediments. Well-developed levees and associated flood plain are seen on the banks of modern incised rivers and are probably not older than 200-300 years. Sand dominance is essentially a Late Holocene phenomenon.

Conclusion

Our observations in the Bengal Basin show that this region is dominated by deltaic environments since Late Pleistocene and has been affected by tectonic movements like uplift, subsidence and eastward tilting. We have been able to detect evidence of relatively dry climate during the Terminal Pleistocene (22 to 16 kyr); and of relatively humid climate and possible landward incursion of coastal processes during the Early Historic times. There is good evidence of delta progradation and incision of streams during Medieval and post-Medieval times, respectively. The uplifted Barind surface of NW Bangladesh has preserved evidence for the existence of a delta environment with predominantly humid/sub-humid monsoonal climate at least since the Early Pleistocene as dated by the paleomagnetic method by Alam (1998). The migratory nature of delta fluvial system which is the inbuilt mechansim coupled with tectonic factors like subsidence, uplift, cymotogeny or even temporary reactivation of certain drainage lines along active lineaments and subtle climatic changes in terms of humid-sub-humid (i.e. summer monsoonal rainfall probably never reached lower limit of 1000-700 mm per annum) during the Early-Mid Pleistocene. The most dramatic environmental change particularly in terms of climate and sea level is witnessed during the Late Pleistocene (70 to 15/16 kyr) including the LGM (22 to 17 kyr). The rainfall went down to 1000-700 mm per annum and the sea level was lower by 100-150 m. The Ganga system was still of a low energy flood plain type with signatures of fluctuating climate from semi-arid (strong) to semi-arid (weak). Probably the Pleistocene-Early Holocene transitional phase was again a dynamic period in terms of environmental change when streams strongly dissected the Barind Upland. Establishment of summer monsoon in the Subcontinent coupled with deglaciation in the catchment of the Ganga in the Himalayas and the rapidly rising sea level due to global eustatic factors were probably the main environmental parameters for such changes during the Early Holocene. Alam's unpublished work on Holocene fluvial system also shows this slow dynamicity of Ganga delta, a predominant factor being the migratory fluvial system with a well established humid climate (with all its catastrophies like cyclones, strong floods and prograding delta towards the coastline). Our work done brings out low flood plain environment (2 to 3 m below the surface) during the Mid-Holocene and Late Holocene and prominent development of sandy levees during the latest Holocene in the entire Bengal Basin. Thus there seems to be a major change in flood dynamics in the last 200-300 years.

This study shows that early hunter-gatherers during the Mesolithic period adapted to the relatively dry environment of the present sub-humid parts of the Western Uplands. The Chalcolithic and Early Medieval adaptation occurred in a low energy flood environment where sites were not exposed to catastrophic floods rather they were faced with intermittent "nuisance" floods. The change in fluvial dynamics with entrenched drainage and progradation of delta occurred only during the Late Medieval period (Table 3).

During the cultural periods stretching from the Chalcolithic to the Early Medieval the constant threat of these "nuisance" floods prompted the majority of the people to live in small-scale and non-permanent settlements with concentrated areas of habitation or large settlements in a few areas. We can surmise that larger areas of habitation occurred in safe zones for purposes of security and multiple subsistence opportunities while a substantial section of the population lived in non-permanent dwellings and adapted to the vagaries of the unstable rivers. With a change in flood dynamics, the sandy deposits of the later period (Late Medieval) buried archaeological settlements associated with the flood plains in central and south Bengal. However no buried site has yet been recovered in North Bengal.

We can therefore, conclude that the dynamic terrain and the constant impermanence of life prompted the people to pattern their settlements according to the particular area they were in, and according to the function the settlement in the system as a whole. In this region a single subsistence strategy, whether agriculture or trade, would have been precarious. What was required was a multiple strategy as well as immediate small-scale measures to cope with the uncertainties and impermanence of the entire region. The archaeological settlement pattern in this region thus seems to be a diverse one governed by the low energy intensity floods and the vagaries of shifting rivers.

This work does not aim to understand all the complex causal factors responsible for the evolution of landscape in this terrain, rather it is a preliminary attempt to evolve a methodology with which to understand the fluvial and flood processes through time. It is argued that there is ample scope to reinterpret the evolution of the landscape in terms of climatic changes, fluctuations in sea level and autochthonous changes associated with the fluvial system along with neotectonics. It is hoped that further geoarchaeological studies will help us to understand the nature of these flood cultures in the humid Ganga delta.

Table 3: Effect of flood witnessed at a few sites

Site	Period	Geomorphic context	Flood effect
Bangarh	Early Historic to Early Medieval	Older Baikunthapur	Channel 2-3 m below the modern channel Flood deposit between Late and Early Medieval periods
Jagjivanpur	Early Medieval	Younger Baikunthapur	Excellent evidence of channel migration
Kandaran	Early to Late Medieval	Older Baikunthapur	Channel migration common
Jagdalla Mahator	Early Medieval	Younger Baikunthapur	Channel near the site, flood danger — no evidence of flood
Raniganj	Early to Late Medieval	Older Baikunthapur	Less flood danger entrenched channel — no migration
Pandu Rajar Dhibi	Chalcolithic to Early Historic	Ilambazar surface	Buried site; Ajay river flowing near the site, abandoned due to floods of the river
Deuli	Chalcolithic	Ilambazar surface	Buried site; secondary context of site situated on older stable surface
Nabagram	Early Historic	Katwa surface	Buried site; river flowing away from the site; disturbed by flooding during medieval times
Bikehat	Early Historic to Medieval	Katwa surface	Buried site, less flood effects; associated with near channel environment of Bhagirathi; settlement on younger alluvium surface
Chandraketugarh	Early Historic to Early Medieval	Katwa surface	Buried site Prone to low energy floods

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Chronology of Harappan Port Towns of Gujarat in the Light of Sea Level Changes during the Holocene

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Abstract

In addition to the well-known habitational site off the coast of Dwarka in Gujarat, one more offshore habitational site, off Hazira (Surat District, Gujarat) has come to light recently. It is proposed that these habitations were pre-Harappan in age. They came into existence when the sea level was a few metres lower than the present, more than 6000 years ago, and part of today's continental shelf was exposed. The onshore Harappan sites like Lothal, Dholavira and Kuntasi, developed as port towns when the sea level was higher than the present about 4500 years ago.

Introduction

During the Middle Holocene, South and West Asia witnessed the rise of three great civilizations, *viz.*, Mesopotamian, Egyptian and Indus (Sindhu) Valley civilization. The enterprising Harappans and pre-Harappans flourished in Gujarat, along the large rivers and in the ancient coastal zones. In Rajasthan, they inhabited the flood plains of ancient river Ghaggar or Saraswati of the Rigveda (Radhakrishnan and Merh 1999).

The available knowledge on the movement of sea level during the Holocene implies that it was about 100 m below the present level at the beginning of the Holocene (10,000 years B.P.). It reached its present level about 6000 years ago, continuing to rise with the coastline moving further inland till about 4500 years ago before regressing to its present level. In this paper, an attempt is made to establish the chronology of coastal zone settlers on the basis of the changes in sea level during the Holocene.

Sea level Changes during the Quaternary

During the 1.8 million years of the Quaternary period, the sea level has fluctuated considerably, with a total amplitude of about 130 ± 45 m. It changed in response to the climatic cooling and warming. During global cooling periods (Glacial events) there was a massive build-up of ice sheets and ice caps in which large quantities of water were stored resulting in worldwide reduction in sea level. During the intervening Interglacial events, decay of ice sheets was the main controlling factor in sea level recovery due to return of the water to the oceans. This simple mechanism is considered to be the main cause of sea level changes during the Quaternary. However, major and long-term sea level changes during older periods of geological history have taken place largely as a result of major tectonic movements, sea-floor spreading, and associated changes in the buoyancy of continents.

It is generally accepted that between 18,000 and 20,000 B.P., the sea level was approximately 120 to 150 m lower than that of today (Fig. 1). Thereafter, it started rising rapidly, at the rate of about 8-10 m/thousand years and reached its present level about 6000 years B.P. It continued to rise at a decreased rate of about 1-1.5 m/thousand years between 6000 and 4500 B.P. Thereafter, it started regressing and reached its present level.

When the sea level was very low during the Last Glacial Maximum (LGM) about 18,000 years ago and even much later in the Holocene, a large part of the present-day continental shelf was exposed (Fig. 2). India and Sri Lanka formed one landmass, Western Indonesia and Japan were both part of the Asian continent while Australia and Papua New Guinea were part of another continent.

The sea level change curve for the Holocene of the India coast is far from clear. From the available data different workers (Hashimi *et al.* 1995; Kale and Rajaguru 1985; Purnachandra Rao *et al.* 1996) have drawn slightly differing curves (Fig. 3a). However, it is certain that the sea level stood below -90m, about 14,500 years B.P. It rose rapidly to around -70 m by 10,000 B.P. continuing to rise, but at a slower pace until 7000 B.P. Between 7000 and 4000 B.P., the steadily rising sea level trend was maintained. The sea level reached 2-4 m higher than the present by about 5000-6000 B.P. (Gupta and Amin 1985). It

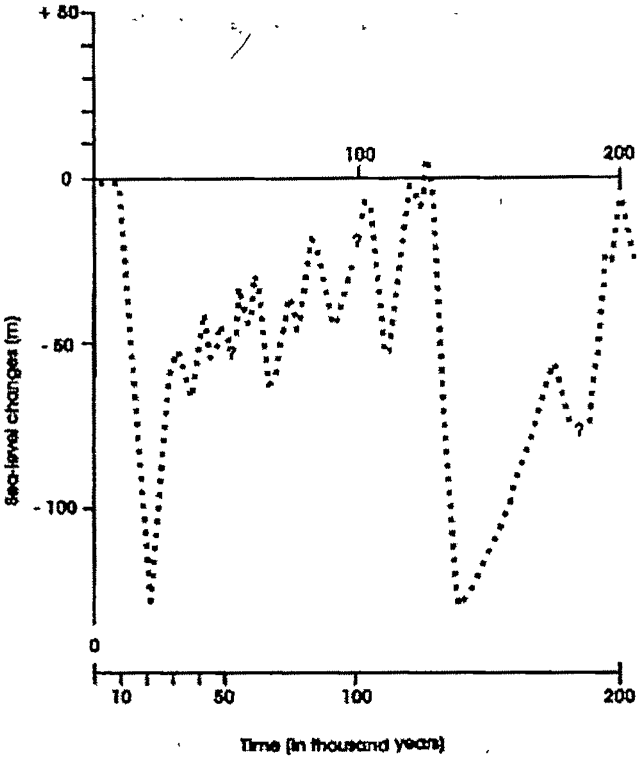

Fig. 1: Global sea level curve for the period of last 200,000 years (after Chappell and Shackleton 1986). Note that it was lowest at ~120 m below the present sea level about 18,000 years ago but rose quickly to reach its present level by about 6000 years ago.

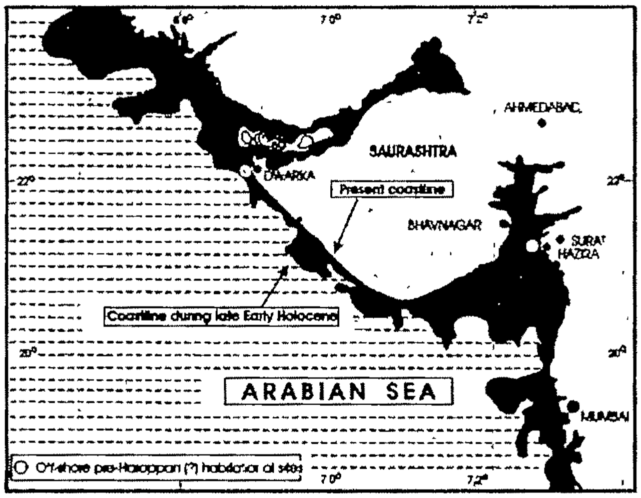

Fig. 2: Palaeogeography during the Early Holocene (modified after Veron 1995). The dark area represents the part of the present-day continental shelf that was a landmass when the sea level was lower than the present

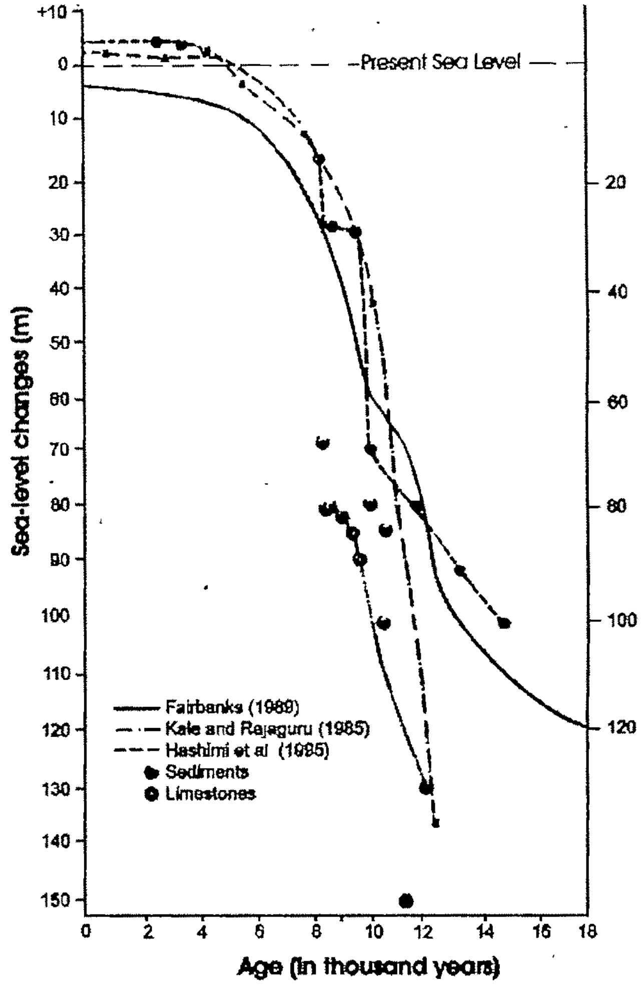

Fig. 3a: Late Pleistocene-Holocene sea level curve (after Purnachandra Rao *et al.* 1996)

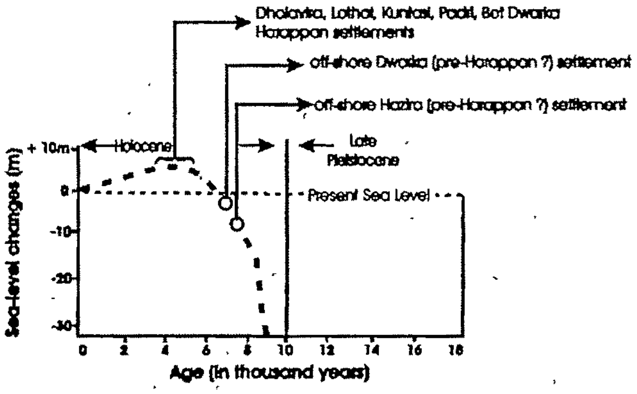

Fig. 3b: Pre-Harappan and Harappan settlement sites with reference to the Holocene sea level (modified after Hashimi *et al.* 1995)

continued to rise further until about 4500 years B.P. (Gupta 1977). Since then, the sea level has been falling as demonstrated by the occurrence of old tidal flats further inland than the newer tidal flats. Even shifts of the coastal dunes, towards the coast, lead to the conclusion that the coast is emerging in the recent times (Mathur 2000). The continental shelf off the Visakhapatnam and Kakinada coast on the

East Coast also provides evidenc of lower sea levels of about -100 m at around 10,000 B.P. (Shrivastava 1978). As on the West Coast, the sea level reached the present level at about 7000 B.P. On the East Coast, it however, continued to rise with a minor pause. The Holocene sea reached its maximum between 6000 and 4000 B.P., as suggested by beach ridges of Krishna-Godavari delta coast (Brückner 1988). A succession of chenier ridges stretching towards the coast, point towards a falling sea level trend during the Middle and Late Holocene on the east coast of India (Krishna Rao *et al.* 1990; Poornachandra Rao 1988).

Maritime Harappans

The known habitational sites of the pre-Harappans and Harappans of Gujarat (Fig. 4) can be grouped in three categories.

1. Sites now submerged under the Arabian Sea or below the present sea level

(a) Offshore Dwarka (Jamnagar District) in Western Saurashtra and popularly known as "submerged Dwarka" (Rao 1985, 2001)

(b) Offshore Hazira (Surat District) that lies 20 km west of Hazira, in the Gulf of Khambhat (Gupta 2002; Ravindran 2001)

(c) A lower habitational site near the township of Dwarka (Ansari and Mate 1966). It falls slightly below the present sea level.

2. Sites close to the present day coast of Saurashtra

(a) Prabhas Patan near Veraval (Junagarh District) (Dhavalikar and Possehl 1992)

(b) Padri (Bhavnagar District) (Shinde 1992, 1998)

(c) Loteshwar, Nagwada (Mehsana District) (Sonawane and Ajitprasad 1994; Possehl 1980; Majumdar 1998, 2000)

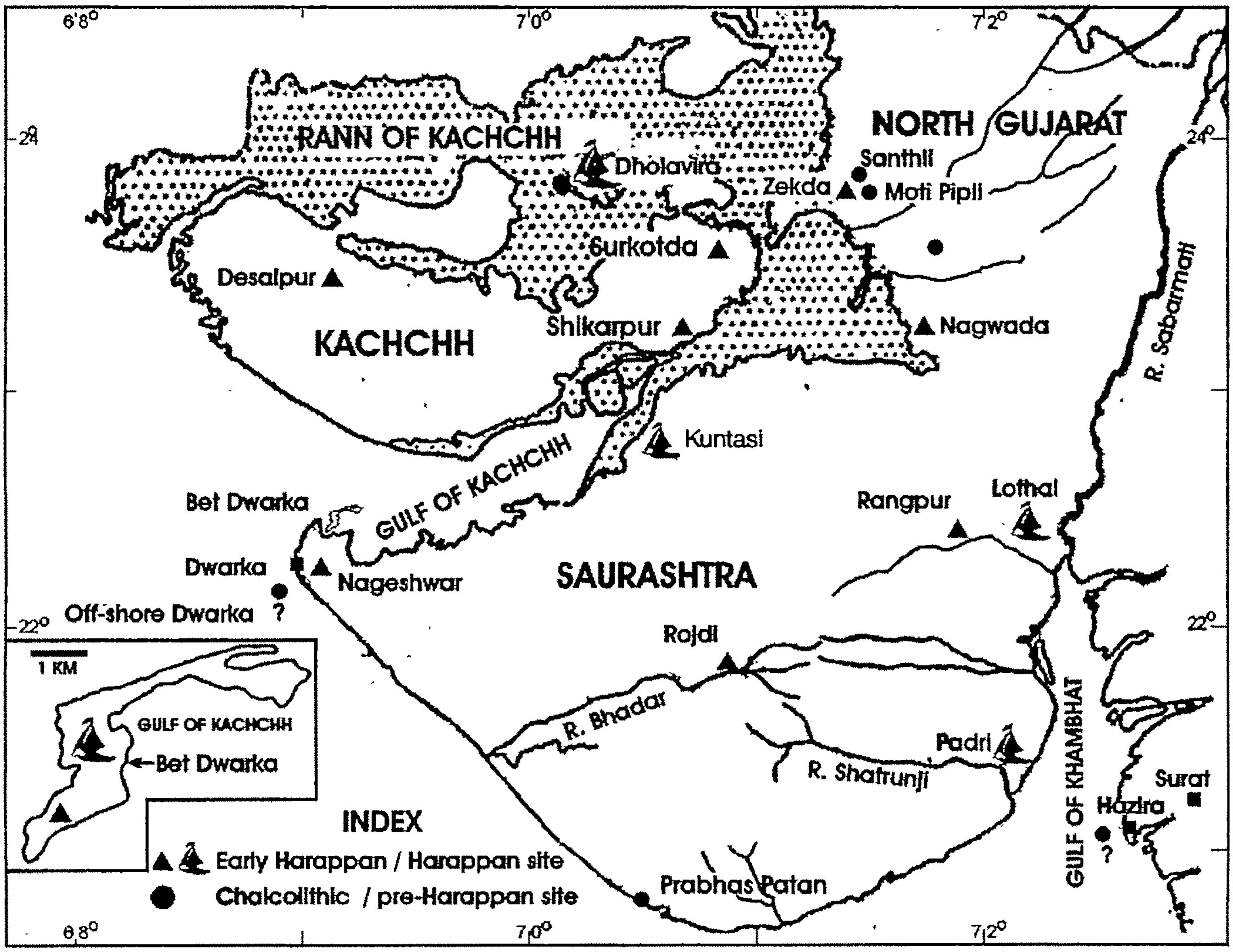

Fig. 4: Chalcolithic, pre-Harappan and Harappan sites in Gujarat (modified after Sonaware and Ajitprasad 1994)

(d) Lower habitational site at Dholavira (Kachchh District) (Bisht 1997). It falls close to the present sea level.

3. Sites in the inland areas of Saurashtra, above the present sea level.

(a) Lothal (Ahmedabad District) (Rao 1985, 1992)

(b) Dholavira (Kachchh District) (Rao 1992)

(c) Bet Dwarka (Rao 1990)

(d) Kuntasi (Dhavalikar *et al.* 1996)

(e) Padri (Shinde 1992; 1998)

The Harappans of North Gujarat, are outside the purview of the present discussion as they were not seafaring people, though they lived very close to the present Rann of Kachchh. Livestock raising was the mainstay of their rural economy (Majumdar 2000).

It is now well-accepted that the Harappans of the coastal zones were maritime communities and had developed urbanized centres. They had developed port towns like Dholavira and Lothal. The latter was probably the world's first tidal dockyard (2350 B.C.). It was located at the head of the Gulf of Khambhat, which has at present a tidal range of more than 9 m. The dock at Lothal was planned on a grand scale to accommodate at least 30 ships of 60 to 80 tonnes capacity. The size of the Lothal dockyard was bigger than that of modern Visakhapatnam. Ingenious methods developed by the Harappans for easy access of large ships to dockyards during high-tides, and their retention in lock-gates during low tides (Rao 1992).

A few other important Harappan ports of Gujarat were located away from the present shoreline (Fig. 4). Among them, Dholavira in the Khadir Bet of the Great Rann of Kachchh is possibly the oldest (c. 3000 B.C.). Kuntasi, located about 3 km southeast of Kuntasi village on the border of the Little Rann of Kachchh, was an important port situated during the Harappan times at a creek mouth. It was a centre for processing raw material for export (Dhavalikar *et al.* 1996). Padri, located 60 km south of Bhavnagar port and one km away from the present shoreline, was a Harappan port (Shinde 1992). People at Padri were not only proficient in catching large fish (Shinde and Thomas 1993) but also knew the art of salt manufacture (Shinde 1992). Bet Dwarka – an island off Okha in the northwestern corner of Saurashtra, was yet another important port during the Harappan period (Rao 1990).

Discussion

On the basis of late Indus Valley civilization script, iron stakes and triangular three-holed anchors, offshore Dwarka is considered as young as of Late Harappan age (Rao 1999). The thermoluminiscence (TL) dating of the pottery found at depths of about 4 to 12 m also suggests a Late Holocene age for offshore Dwarka. In this context, it can be noted that the TL dating method gives the date of the last burial of the object, though it may be much older in age. Therefore, a possibility exists that the offshore Dwarka is of greater antiquity as suggested in this paper. It is proposed that offshore Dwarka and offshore Hazira developed more than 6000 years ago, on a part of the exposed landmass when the sea level was still a few metres below the present-day level (Fig. 3b). Under this model, the antiquity of offshore Dwarka goes back by more than 2500 years, as compared to the present thinking that it was about 3500 years old.

The submergence of human relics and suspected building sites could be explained either as the result of down faulting due to neotectonism of a former habitational site or due to rise in sea level (Shepard 1964). There appears to be little possibility of the offshore Dwarka being a down faulted block, as there is no evidence of neotectonic movement and seismicity in the area, though they are present in the neighbouring Kachchh peninsula (Biswas and Khattri 2002). Comparatively, the Saurashtra peninsula, as a whole, is neotectonically very stable (Mathur 2000). As far as Dwarka area is concerned, even the records of the penultimate Interglacial sea level (Somayajulu *et al.* 1985) furnished by dead corals, favour a near stable condition in the area during the Late Pleistocene-Holocene. Harmon *et al.* (1981) have shown at more than 30 'near-stable' localities that the sea level stood in a narrow height range of 4-6 m above the present sea level at about 125,000 years ago. Somayajulu's dating of last interglacial corals to this range around Dwarka shows that it belongs to a tectonically stable coast. Had the area been neotectonically disturbed, the Dwarka-Okha corals, dated to be 118,000-126,000 years old, would have occupied a different altitude. Therefore, it is logical to conclude that the offshore Dwarka habitational site is *in situ*. This site, along with offshore Hazira, must have got established more than 6000 years ago when the sea level was lower than the present. It was subsequently submerged, as the sea level rose (Fig. 3b). The suggested model of correlation between sea level changes and evolution of habitational sites is corroborated by the dating of offshore Hazira artefacts that are ~7500 years old (Gupta 2002).

As the sea level continued its fast rising trend during the Holocene Interglacial, the near-shore non-Harappan Chalcolithic cultures of Dholavira, Loteshwar, Nagwada, Prabhas Patan developed when sea level reached slightly higher than the present level about 6000-5500 years ago.

As the sea level rose further and transgressed inland about 5000-4500 years ago, the Harappans established the port towns of Lothal and Dholavira. During this time, the Rann of Kachchh was a shallow arm of the sea, on the

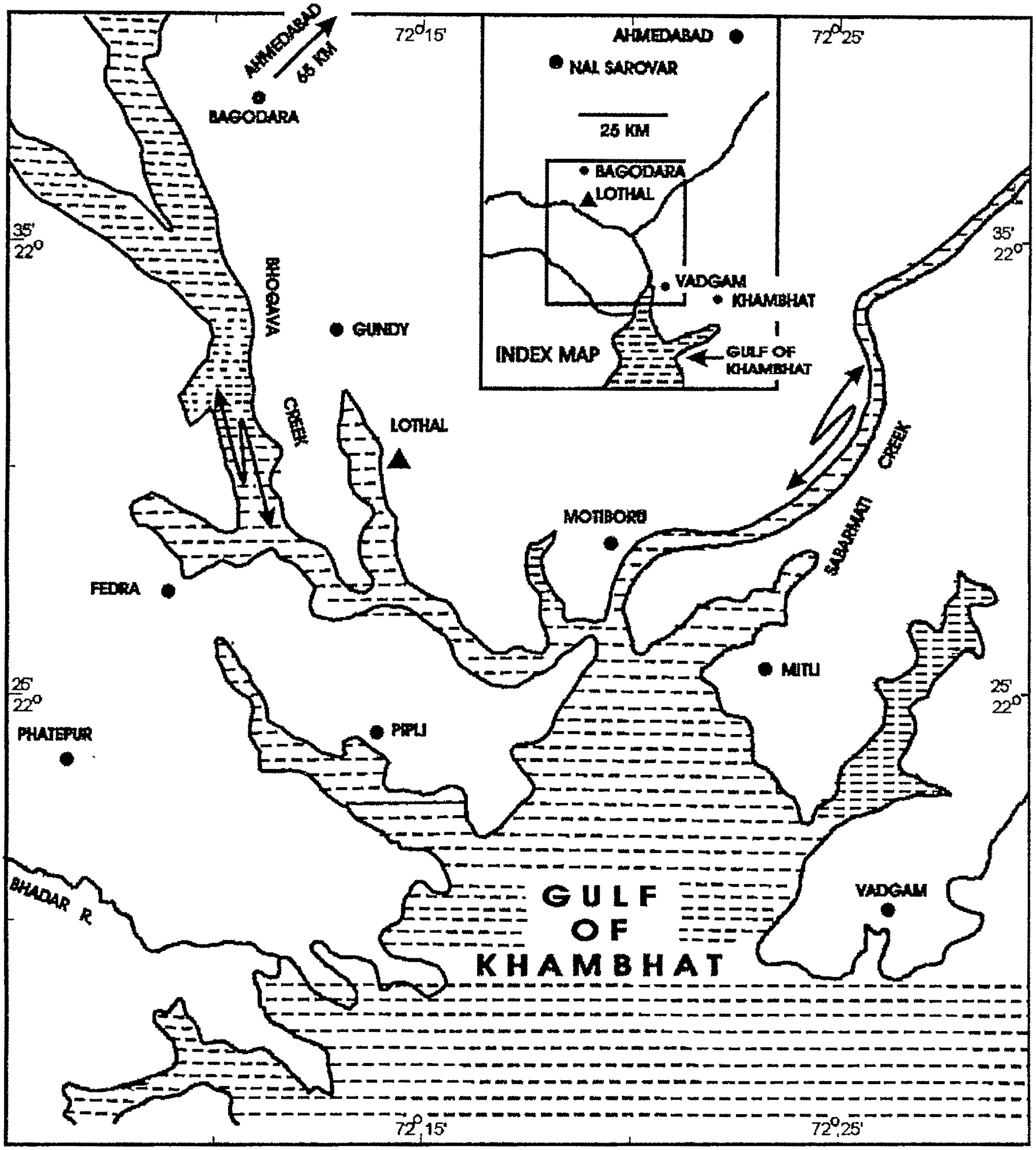

Fig. 5: Late Holocene Palaeogeography of Bagodara-Lothal-Vadgam area, Gujarat, showing Bhogava Creek that acted as the main channel for boats/ships reaching Harappan town of Lothal by about 4500 B.P.

shore of which port towns of Dholavira, Kuntasi, etc., got established. This was also the time when Lothal got linked with the Gulf of Khambhat and the Arabian Sea (Fig. 5).

The foraminifera of both benthic and planktonic species found in the sediments of Lothal (Nigam 1988) bear testimony of its link with the open sea. Thus, it can be concluded that the urbanised Harappan port towns of Gujarat got easy access through sea to Sind (Pakistan), Egypt, Mesopotamia and Persian Gulf countries.

After reaching its highest level by about 4500 years ago, the sea level again started regressing, the above port towns of Harappan civilization were left high and dry. The decline of Harappan civilization in Gujarat occurred about 3750-3700 years B.P. and that coincided with the regression of the sea level from inland Gujarat (Sarma 1971).

It is concluded that the offshore Dwarka habitation appears to be of much greater antiquity and not related with the temple town of Dwarka that got established less than 2500 years ago. It is plausible that many satellite habitations had developed on the land exposed along Dwarka-Hazira tract when sea level was lower than the present in the Early Holocene and the off-shore habitational sites are much older than hitherto believed. Even the recently discovered habitational site off Mahabalipuram coast in Tamil Nadu may be contemporary to the Gujarat offshore sites. The relationship of sea level changes and location of the ancient habitations can be better established only when further investigations are carried out in the near shore region of India, particularly offshore region of Saurashtra and Tamil Nadu, keeping in view the proposed model.

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Evolution of Settlement Types, Material Culture, and Urbanism in Early Historic Period Phase II Gujarat, Western India*

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Abstract

This paper attempts to understand the evolution of settlement types, material culture and urbanism during the Early Historic Period (EHP) Phase II (~100 B.C to 500 A.D), in Gujarat, Western India. It seeks to identify the differences in the distribution of material culture in relation to settlement types, based on cluster analysis of five types of influence, namely, foreign trade, political system, religion, monetized exchange, and defense systems. Based on cluster analysis of 51 EHP Phase II settlements, seven settlement types are identified.

The frequencies of the types of influence and their combinations indicate that monetized exchange combined with political influence may be the most important catalyst for the evolution of settlement complexity. Implications of these findings are discussed in the context of the research on the evolution of urbanism, and suggestions for future research are made.

Introduction

In this paper a typology of settlement types is proposed based on the cluster analysis of five types of influences on settlement types in Phase II of the Early Historic Period (EHP) in Gujarat. The differences between these settlement types may provide valuable insights into the evolution of EHP Phase II settlements, material culture, and urbanism in Gujarat.

Given the discontinuity between the first urbanization in India (2500 B.C. to 1800 B.C.) and the second urbanization beginning in 7th century B.C., the roots of social complexity, religion, craft production technologies, art styles, social stratification, and economic and political practices in Medieval and post-Medieval India may well lie in the way urbanism emerged in India's predominantly agrarian society during the Early Historic Period (EHP). EHP has been dated between 7th century B.C. and 5th century A.D. in parts of the Gangetic valley, and between 3rd century B.C. and 5th century A.D. in other parts of India such as Gujarat. The archaeological study of the settlement patterns, economy and culture of this important and long, but relatively neglected period, thus merits a detailed study in its own right (Allchin 1998; Allchin *et al.* 1995; Chakrabarty 1995: 226).

The research reported in this paper is a small step forward in understanding the evolution of settlement types, material culture and urbanism during Early Historic Period (EHP) Phase II, dating between approximately 1st century B.C. and 5th century A.D. in Gujarat, Western India. It seeks to identify Early Historic settlement types and the differences in the distribution of material culture between these settlement types. The larger goal is to understand the importance of factors such as foreign trade, politics and religion, monetized exchange, and defense systems in the evolution of settlements and differences in the material culture during EHP Phase II Gujarat. An attempt is made to identify the combinations of these five factors and their possible role in the development of settlements in Early Historic Gujarat. The evolution of settlements and urbanism is generally considered to result from an interaction between a variety of factors (Flannery 1972; Sanders and Webster 1978).

Influences on Settlement Types

Allchin *et al.* (1995) have proposed that urbanism in the Early Historic Period in Gujarat emerged after the conquest of Gujarat by the Mauryas, a powerful Northeastern Indian centralized state around 3rd century B.C. The evolution of urbanism at Vijayanagara in Medieval times after it was chosen as a political seat (Sinopoli 1995; Sinopoli and Morrison 1995) and "compulsory urbanism" by the Mauryan state in India and the Incas of Peru (Kangle 1988; Morris 1972) suggest different processes through which the development of a state could encourage the evolution of urbanism. Thus, it would be interesting to explore the significance of political influence in the development of settlements in Gujarat during the EHP.

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Gujarat has the longest coastline of all the states in India (Rajgor 1994). Bharuch was an important port-cum-city in EHP Gujarat (Chandra 1977; Ray 1994). Research by Rathje (1971) in Mesoamerica, Fentress (1976) in Indus valley, and Lamberg-Karlovsky (1972) in Mesopotamia points to the importance of trade in the evolution of urbanism. Differential distribution of resources could lead to different trade patterns and consequentially different patterns of urbanism. Therefore, it is important to investigate the importance of trade in the evolution of material culture, settlements, and urbanism during EHP Gujarat.

The ability of a settlement to provide security through military architecture and a trained army could attract population flow and lead to the development of multiple settlement functions such as craft production and trade, as exemplified by the evolution of urbanism in the Yoruba settlements in Africa and Vijayanagar in India (Sinopoli 1995; Sinopoli and Morrison 1995; Trigger 1972). Thus, it would be interesting to identify the frequency of settlements with defense systems and whether or not the defense system was associated with other functions such as political influence and trade.

Some of the most ancient cities in China and Mesopotamia seem to have developed as ritual centres in the beginning, and later acquired political and trade functions (Adams 1966; Wheatley 1971, 1972). In addition, there are examples of modern Indian cities such as Dwarka, Palitana, Kashi, and Puri that have developed around religious functions and services that these settlements provide. An attempt to shed light on the proportion of religious sites in EHP Gujarat and whether and in which the way in which religion was combined with other functions has been made.

During EHP Phase II, internal as well as external exchange was apparently performed through barter as well as monetized exchange (Chandra 1977; Jha 1991; Ray 1994). Therefore, the distribution of EHP coins may give insights into the extent of a monetized economy in Gujarat. The association of monetization with other artefacts could shed light on the sort of material culture associated with monetization.

The evidence available for EHP Phase I settlements is very meagre. More abundant archaeological indicators are available for assessing the influences on settlement types in EHP Phase II Gujarat commencing around the 1st century B.C. and ending around the 5th century A.D. so the analysis is confined to EHP Phase II.

Artefact Indicators of Types of Influences

The five above mentioned potentially significant types of influence on the evolution of EHP Phase II settlements are represented through the following artefact types in Gujarat. Influence of foreign trade in EHP Phase II Gujarat is primarily indicated by the presence of Mediterranean amphora and the occasional occurrence of seals and cameos (Ansari and Mate 1966; Bhan 1983; Deo 1992; Ghosh 1989; Jairath 1986; Mehta 1955, 1968; Mehta and Chowdhary 1966, 1975; Mehta and Patel 1967; Momin 1979; Nanavati *et al.* 1971; Subbarao 1953; Subbarao and Mehta 1955). Though exact foreign sources and dates of these artefacts are not available, and there is a possibility that some of them may be local imitations of foreign goods (Deo 1992; MacDowall 1996), these artefacts can be considered to be at least suggestive of the influence of foreign trade.

The seals and inscriptions issued by the Western Kshatrapas, Guptas, Traikutakas and Huns or their administrative representatives in Gujarat during EHP Phase II are the primary indicators of political influence (Ghosh 1989; Majmudar 1960; Rajgor 1998). Monetized exchange influence type is indicated by the silver and copper coins issued by the Western Kshatrapas, Guptas and Traikutakas dated to first five centuries of the Christian era (Jha 1991; Majmudar 1960; Rajgor 1998). Influence of defense systems type is indicated by military architecture such as forts, ramparts or ditches (Ghosh 1989; Mehta and Patel 1967; Rao 1966). Influence of religion is indicated by the presence of religious architecture such as Buddhist stupas and viharas, Jain and Buddhist rock-cut caves, and Hindu temples (Ghosh 1989; Majmudar 1960; Mehta and Chowdhary 1966). Each of the five types of influence represented by the above-mentioned artefact classes have been considered as a variable, and are utilized for performing cluster analysis.

One or more artefact types were identified for each of the types of influence. For scoring, a binary scale was used, in which '1' meant the presence of any or all of the artefacts constituting the type of influence and '0' meant the absence of all of these artefact types. For example, EHP Phase II site of Dwarka has yielded two artefact types indicating the influence of foreign trade, namely, Mediterranean amphora and Roman seals. Thus, '1' would be entered for indicating the influence of foreign trade. Even if Dwarka had yielded only the Mediterranean amphora, '1' would have been entered to indicate the influence of foreign trade. Had Dwarka yielded none of the indicators of foreign trade, '0' would have been entered.

The major settlement types in Gujarat were first identified by performing a cluster analysis using the five types of influence identified in 51 EHP Phase II settlements. Then the distribution of material culture in these settlement types was compared. Later, the markers or dated artefact/feature types not used in the cluster analysis such as Red Polished Ware and dated civil architecture were compared. Identification of the distribution patterns of important types of influence was also attempted.

Data Sources and Survey Methods

The data utilized in this research were obtained from various excavation reports, encyclopedias and unpublished Ph.D. dissertations focusing on settlement patterns in Gujarat (Ansari and Mate 1966; Bhan 1983; Bharucha 1997; Ghosh 1989; Jairath 1986; Mehta 1955, 1956, 1968; Mehta and Chowdhary 1966, 1975; Mehta and Patel 1967; Momin 1979; Nanavati *et al.* 1971; Sonawane 1979; Subbarao 1953; Subbarao and Mehta 1955), and a survey conducted in the Mangrol and Malia taluks (sub-districts) in Saurashtra, Western Gujarat.

All the Gujarat EHP Phase II surveys have been done by the compass and pace method and the sites have been located by village-to-village survey. Sampling methods have not been used for collecting artefacts. Sites have been recognized as EHP Phase II through the presence of those artefacts identified as EHP Phase II markers on excavated sites (Ansari and Mate 1966; Bhan 1983; Ghosh 1989; Jairath 1986; Mehta 1955, 1968; Mehta and Chowdhary 1966, 1975; Mehta and Patel 1967; Momin 1979; Nanavati *et al.* 1971; Subbarao 1953; Subbarao and Mehta 1955).

Data

Out of 310 Early Historic Period sites (including EHP Phase I and Phase II settlements) reported in Gujarat (Fig. 1), 223 sites yielded at least one of the EHP Phase II marker type such as inscriptions, coins, Red Polished Ware, Black Polished Ware, amphora, and dated architecture including the bricks of the size of 38-46 x 20-25 x 6 cm (Ansari and Mate 1966; Bhan 1983; Ghosh 1989; Jairath 1986; Mehta 1955, 1968; Mehta and Chowdhary 1966, 1975; Mehta and Patel 1967; Momin 1979; Nanavati *et al.* 1971; Subbarao 1953; Subbarao and Mehta 1955).

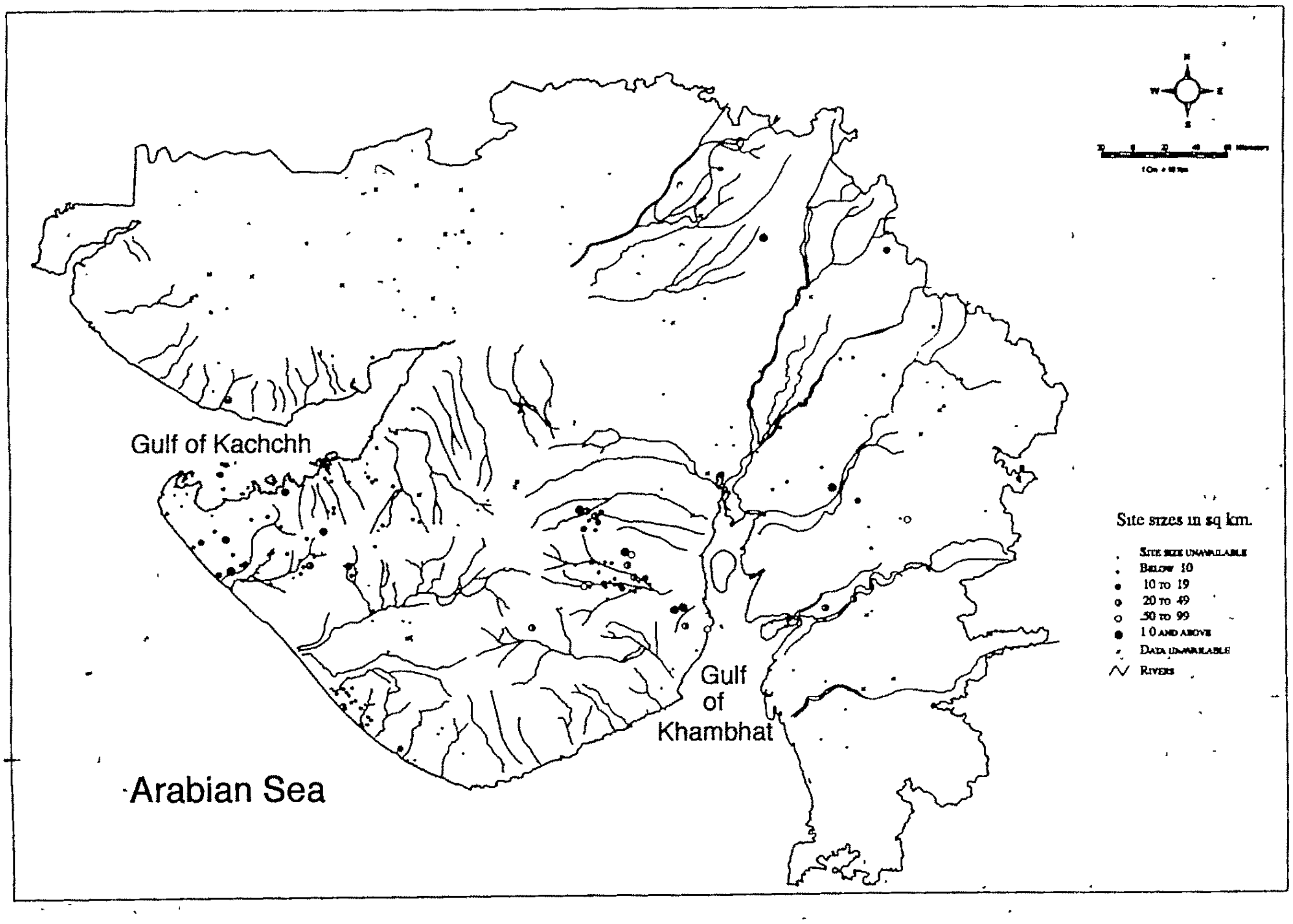

Fig. 1: Distribution of Early Historic sites in Gujarat

Out of these 223 EHP Phase II sites, 51 sites were selected with two or more of the above-mentioned marker types, since these sites were likely to have been surveyed in more detail or with more care, and therefore were more likely to yield more reliable indicators of settlement types.

Method of Analysis

Between-group average link hierarchical agglomerative cluster analysis, a well-known statistical method for classification (Baxter 1994) has been used in order to identify settlement types in EHP Phase II Gujarat. As the data are binary, hierarchical clustering methods are preferable (Baxter 1994). An advantage of average link cluster analysis is that it amalgamates clusters on the basis of similarity between groups rather than just between a pair of individuals and thereby gives more interpretable clusters (Baxter 1994). Simple matching coefficient was used, as it takes into account all the possible variations of absences and presences including co-absences and co-presences.

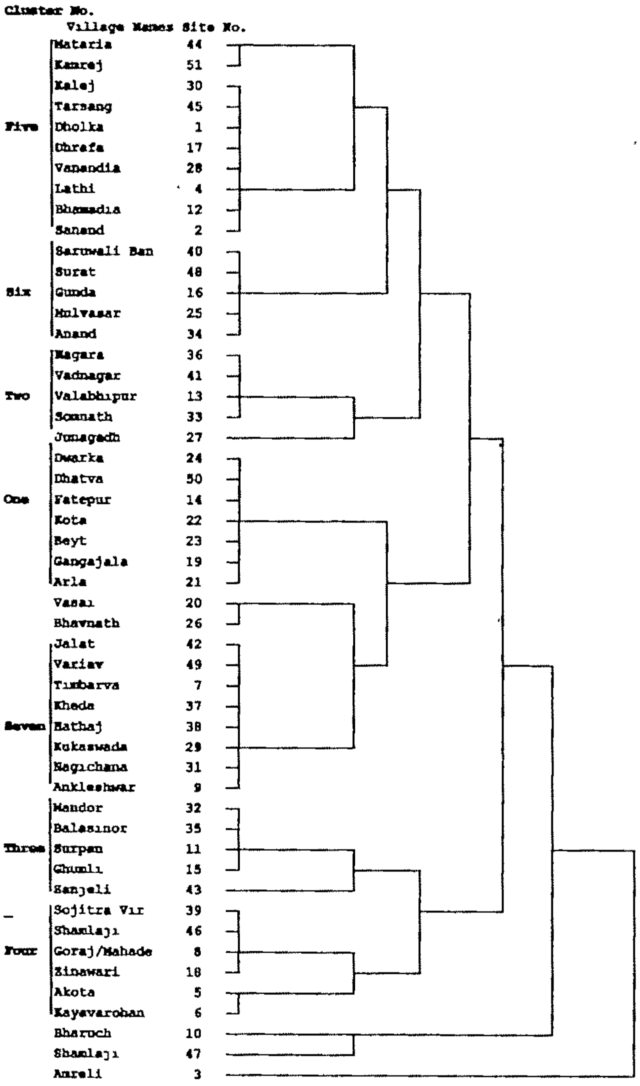

Fig. 2: Dendrogram (Average Linkage Hierarchical Cluster Analysis) of 51 EHP Phase II Sites in Gujarat Vis-à-vis Foreign Trade, Religious, Defense System, Political, and Monetization Influences

Though, cluster analysis is a powerful empirical method widely used by archaeologists for arriving at a typology, it is an exploratory heuristic program and can yield a variety of typologies depending upon the chosen modes of cluster analysis. Therefore, cluster analysis has been used for getting a preliminary insight into EHP Phase II settlement types, rather than accepting clusters at a particular level. Only those types have been used which have at least five cases, except when there is a special reason for including a type with less than five cases.

Data Analysis

Diversity of Settlement Types

Seven clusters were extracted, which had a high interpretable value and had at least five sites (Table 1, Fig. 2). These seven clusters seem to represent the following seven EHP Phase II settlement types:

1. Settlements influenced by foreign trade;
2. By foreign trade and coinage;
3. By religion;
4. By religion and coinage;
5. By coinage;
6. By politics and coinage; and
7. No influence.

These seven settlement types account for 46 out of the 51 sites in the sample. The rest of the five sites are either outliers or clusters with less than five cases.

Though settlement types 1, 3, and 5 have high mean scores ('high' here implies between 0.5 and 1.0) for at least one of the five types of influence, and settlement types 2, 4, 6 for at least two of the five types of influence, settlement type 7 has high scores on none of the five types of influence. No settlement type has high mean scores for more than two types of influence (Table 1).

There are at least two types of influence of foreign trade and religion in EHP Phase II Gujarat, one without monetized exchange, and the other with monetized exchange (Table 1). Such a division does not seem to appear *vis-à-vis* political influence. While monetized exchange combines with all other types of influence on several sites, and also has its separate settlement type, at least three settlement types out of the seven score very low on monetized exchange. This pattern indicates a mixed economy based on monetized exchange as well as barter, and a likely evolution from non-monetized economy to monetized economy. Settlement type 7 without any type of influence appears to consist of simple habitation sites.

Table 1: Cluster analysis based settlement types and means of constituent influences

Cluster No.	Settlement Types	No. of Sites	Defense System Influence	Religious Influence	Political Influence	Foreign Trade Influence	Monetized Exchange Influence
1	Foreign trade influence	7	0	0	0	1.0	0
2	Foreign trade and monetized exchange influence	5	0	0	0.20	1.0	1.0
3	Religious influence	5	0	1.0	0.20	0	0
4	Religious and monetized exchange influence	6	0	1.0	0	0.33	1.0
5	Monetized exchange influence	10	0.20	0	0	0	1.0
6	Political and monetized exchange influence	5	0	0	0.80	0	1.0
7	No influence	8	0	0	0	0	0

Civil architecture (comprising of house floors, house walls and wells) is a habitation indicator. Four out of the seven settlement types score high on civil architecture, suggesting habitation (Table 2). Out of these four, three settlement types have one or more specialised functions such as foreign trade and monetized exchange, religious influence, and religious influence and monetized exchange, while one without any type of influence also scores high on civil architecture. Surprisingly, settlements only influenced by foreign trade (settlement type 1), only monetized exchange (settlement type 5), and monetized exchange and political influence (settlement type 6) score low on civil architecture. The reasons for these low scores remain to be understood.

Urbanism and Material Culture in EHP Phase II Gujarat

The information on EHP Phase II Gujarat settlement types, their associated material cultures and Childe's (1950)

Table 2: Incidence of civic architecture in cluster analysis based settlement types

No.	Settlement Types	No. of Sites	EHP Phase II Civil Architecture
1	Foreign trade influence	7	0.14
2	Foreign trade and monetized exchange influence	5	0.80
3	Religious influence	5	0.60
4	Religious and monetized exchange influence	6	0.50
5	Monetized exchange influence	10	0.20
6	Political and monetized exchange influence	5	0.20
7	No influence	8	0.50

Table 3: Settlement types, associated material culture, and presence of Childe's urban characteristics

No.	Settlement Type	High Incidence of Civic Architecture Score of 50% and more	Material Culture on Representative Sites	Childe's Urban Characteristics
1	Foreign trade influence	No	Several ceramic types including RPW, wattle-and-daub architecture, Mediterranean Amphora and seal and shell bangles.	1. Long-distance trade
2	Foreign trade and monetized exchange influence	Yes	Several ceramic types including RPW, shell bangles, stone terracotta, glass, and shell beads, craft production (shell waste, glass slag and iron slag), terracotta and stone sculptures, inscriptions/seals, miscellaneous antiquities, metal objects and coins.	1. Craft specialization 2. Developed art styles 3. Long-distance trade 4. Literacy
3	Religious influence	Yes	Kaolin ware, RPW and religious architecture.	1. Monumental architecture
4	Religious and monetized exchange influence	Yes	Several ceramic types including RPW, stone beads, shell bangles, metal objects, terracotta and stone sculptures, miscellaneous antiquities, religious architecture and public architecture, coins and inscriptions/seals.	1. Developed art styles 2. Monumental architecture 3. Literacy
5	Monetized exchange influence	No	Several ceramic types including RPW; stone, glass, shell and terracotta beads; shell bangles; shell waste; coins.	1. Craft specialization
6	Political and monetized exchange influence	No	Ceramic types, political inscriptions/seals, coins, architecture.	1. Literacy 2. State
7	No influence	Yes	Several ceramic types including RPW, stone and terracotta beads, metal objects, terracotta/stone discs, seals, miscellaneous antiquities, wattle-and-daub architecture.	1. Literacy

urban attributes present in each settlement type is presented in Table 3. Childe (1950: 3-17) has enumerated ten attributes of urbanism: larger sites size and greater occupation density; developed arts; occupational and craft specialization; literacy; state or political centralization; long-distance trade; monumental architecture; exact and predictive sciences; taxation; and social hierarchy. Four out of ten attributes, namely, site size or population density, social hierarchy, taxation, and exact and predictive sciences have been excluded from consideration, as adequate information is not available for assessing the presence of these attributes.

The settlement type 2 (foreign trade and monetized exchange) and settlement type 4 (religious and monetized exchange) have richer material culture as compared to other settlement types (Table 3). It also indicates that though none of the EHP Phase II settlement types has all six urban attributes, settlement type 2 (foreign trade and monetized exchange) comes closest to Childe's definition of urbanism with four out of six urban attributes, while settlement type 4 (religion and monetized exchange) has three urban attributes. The urban attributes in the rest of the settlement types range from one to two. The settlement types influenced by foreign trade (settlement type 1),

Table 4: Results of cluster analysis done on seven settlement types

No.	Settlement Type	Frequency of EHP Phase II Sites in Each Settlement Type	North Gujarat	South Gujarat	Saurashtra	Kachchh
1	Foreign trade influence	7	0	1	6	0
2	Foreign trade and monetized exchange influence	5	2	0	3	0
3	Religious influence	5	2	1	2	0
4	Religious and monetized exchange influence	6	5	0	1	0
5	Monetized exchange influence	10	4	2	4	0
6	Political and monetized exchange influence	5	1	1	2	1
7	No influence	8	4	2	2	0

religion (settlement type 3), monetized influence (settlement type 5) and no influence (settlement type 7) have a relatively under-developed material culture and have only one urban attribute each. Political and monetized exchange influence (settlement type 6) has two urban attributes.

During EHP Phase II in Gujarat the primary shaper of urbanism seems to have been foreign/long-distance trade-cum-monetization-cum craft specialization, while religious or political influence combined with monetization may have been secondary influences *vis-à-vis* the evolution of urbanism.

Regional Distribution

The settlement types do not appear to be randomly distributed all over Gujarat. Table 4 indicates that sites of settlement type 1 (influenced by foreign trade) and settlement type 4 (influence of religion and monetized exchange) are concentrated in Saurashtra and North Gujarat, respectively, while the sites of the other settlement types seem to be distributed more or less randomly. In settlement type 1 six out of seven sites are in Saurashtra, concentrated in the Jamnagar District, while in settlement type 4, five out of six sites are in North Gujarat districts. If we combine the influence of foreign trade related settlement types (settlement types 1 and 2), and the two religious influence related settlement types (settlement types 3 and 4), it is clear that influence of foreign trade settlements are concentrated in Saurashtra with a secondary concentration in Northern Gujarat, while religion influenced settlements are concentrated in Northern Gujarat, with a secondary concentration in Saurashtra.

Settlement Complexity

Sites with several influences are likely to be more complex, in terms of diversity of sub-cultures, economic activities, and occupations, than sites with fewer influences. Interactions between these sub-cultures, activities, and occupations could lead to innovations, and therefore to further material and cultural development (Barnett 1953). Table 5 shows the number of sites with no influence, those with a single influence, those with two influences, three influences, and four influences respectively. Over half the sites had only one or no influence, over a quarter had two influences, while just about a fifth had three or four influences. Interestingly, monetized exchange was an influence on over half the sites, substantially more than political influence (19 sites), influence of foreign trade (16 sites), religion (12 sites), and defense (4 sites). More important, monetized exchange was an influence on all the sites with three or more influences, and on eleven out of fourteen sites with any two influences. Thus, monetized exchange may have been a prime catalyst of site complexity. Out of the 24 relatively complex settlements with at least two influences, the combination of monetized exchange and political influence was found on 14 sites, the combination of monetized exchange and foreign trade was

Table 5: Frequency of sites vis-à-vis influence types and their combinations

Influence Types and Their Combinations	Frequency	%
No influence	7	13.7
Single influence only	20	39.2
Two influences only	14	27.4
Three influences only	8	15.7
Four influences only	2	4.0
Total Sites	51	100.0

found on 8 sites, and the combination of religious influence and monetized exchange was found on 7 sites (Table 6). Political influence and religious influence combination was another fairly common one, found on 8 of the settlements with two or more influences (Table 6). Interestingly, political and foreign trade combination was found on only 5 settlements, and foreign trade and religious influence was even rarer (only 2 settlements) (Table 6). Thus, the combination of monetized exchange with political influence was the most important path to settlement complexity, followed by monetized exchange with influence of foreign trade, political influence with religious influence, monetized exchange with religious influence, and foreign trade with religious influence. To the extent that monetized exchange implies commercial activity, settlement complexity in EHP Phase II Gujarat seems to have been catalyzed mainly by commercial activity and political power and/or foreign trade, and/or religious activity. Political power and religious influence, (which may imply state patronage of religious activity), were also significant catalysts of settlement complexity.

Table 6: Frequency of sites vis-à-vis combinations of any two influences

No.	Influence Combinations	Frequency
1	Monetized exchange and political influence	14
2	Monetized exchange and foreign trade influence	8
3	Religious and monetized exchange influence	7
4	Political and religious influence	8
5	Political and foreign trade influence	5
6	Foreign trade and religious influence	2
	Total Sites	44

Analysis of Settlement Types

The material culture of the seven identified EHP Phase II settlement types can point to the potential for urbanization that may have emerged in EHP Phase II Gujarat, and also its form. For this purpose, one or two representative sites of each settlement type, preferably excavated sites (because of the diversity of artefacts that they reveal and their greater dating reliability) have been examined in some detail. Thereafter, an attempt has been made to identify their urban features, based on those enumerated by Childe (1950). Table 3 summarizes this analysis.

In Table 3, artefact types (markers as well as non-markers) on which the settlement types scored high mean scores (0.50 and above) are also listed. For this purpose, I have indicated only those non-markers that have been dated in excavations, whether stylistically, paleographically, or through chemical dating methods to EHP Phase II.

1. *Influence of Foreign trade*: All the seven sites in this type have yielded Mediterranean amphora, while one site (Dwarka) has also yielded a Roman metal seal. In addition to the artefacts indicative of foreign influence, this group of sites scores high on RPW (1.00). The excavated site of Dwarka has also yielded stones cemented by red clay, without a precise plan or alignment, interpreted as a wattle-and-daub hut, several ceramic types, and shell bangles (Ansari and Mate 1966).

The presence of shell bangles at Dwarka is consistent with the high score (0.57) of shell bangles for this settlement type, while the poor diversity of artefact remains is consistent with the low scores of non-markers such as beads, sculptures, and metal objects. Settlement type 1 sites are primarily small sized sites (0.02-0.03 km^2) and relatively close to the present coastline (between 3 and 45 km), and with one exception, occur in the Jamnagar District of Saurashtra. Thus, the influence of foreign trade found at these sites is more likely to have arrived through maritime than land routes. On the whole, the influence of foreign trade seems to have a relatively underdeveloped material culture.

2. *Influence of foreign trade and monetized exchange:* Four sites in this settlement type have yielded sherds of the

Mediterranean amphora, while the fifth has yielded a sealing indicative of Roman influence. These sites have yielded Kshatrapa and Gupta coins. Three of the five sites are excavated and on the whole this group of sites has rich material culture, scoring high on stone beads (0.60), terracotta beads (0.60), craft production (0.60), shell bangles (0.60), inscriptions and seals (0.60) and miscellaneous antiquities (0.80), RPW (1.0), and civil architecture dated to EHP Phase II (0.80). Two of the excavated sites yielded stone and clay sculpture types and metal objects, and all the excavated sites yielded miscellaneous antiquities.

Settlement type 2 sites seem primarily to be craft production (shell waste or iron slag) and trade centers, with influence of both foreign trade and monetized exchange. Out of the five sites, three are within 45 km from the present coastline, and may have had direct access to goods from the coastline, while two sites are inland centres, one of which is situated on the then major trade route linking Northern India and the Deccan. The material culture appears to be richer than that of settlement type 1 sites.

3. *Religious Influence:* The five sites in this settlement type have yielded evidence of Buddhist viharas, caves, and brick structures; Hindu temples; and structures interpreted as indicative of religious influence (Bhan 1983; Ghosh 1989). This settlement type scores high on RPW and civil architecture (Table 4), but scores very low on other artefact types such as beads, sculptures, metal objects, craft production, shell bangles and so forth. This suggests low development of material culture. Even the archaeological data from the excavated site in this settlement type are consistent with the picture of low material development.

4. *Influence of Religion and monetized exchange:* Out of the six sites in this settlement type, three have yielded the remains of temples, two have yielded structures interpreted to be religious structures, while one (Devni Mori) has yielded the evidence of Buddhist viharas and stupas (Ghosh 1989; Mehta 1956; Mehta and Chowdhary 1966; Mehta and Patel 1967). This settlement type has yielded coins primarily of Kshatrapas and Guptas, and occasional incidence of Andhra and Kushana coins.

Out of the six sites, four sites, namely, Akota, Kayavarohan, Shamlaji (Devni Mori), and Goraj were excavated. This settlement type has scored high on datable artefacts such as stone beads (0.67), shell bangles (0.50), metal objects (0.50), terracotta sculptures (0.50), stone sculptures (0.83), and inscriptions and seals (0.67). The score on craft production (iron slag and shell waste) is not high. The primary function of these sites appears to be religious, but the presence of monetized exchange and several other artefacts indicates a relatively rich material culture. Five of these six sites are located in North Gujarat, and thus the distribution of this settlement type seems to be region-specific.

5. *Influence of monetized exchange:* This settlement type has the largest number (10) of sites and has primarily yielded Kshatrapa coins, though one or two sites have also yielded Gupta, Traikutaka, and Andhra coins (Ghosh 1989; Sonawane 1979). This settlement type has scored low on artefact types such as beads, sculptures, metal object, shell bangles and craft production. However, a small sized (0.05 km^2) single-component site of Kalej, in Mangrol taluk, has yielded a variety of ceramic types including RPW sherds; an unfinished stone bead; a shell, a glass, and a terracotta bead; shell bangles; and shell production waste, in addition to coins. Thus, this settlement type may include small/medium-sized EHP Phase II craft production and monetized exchange centers. The reason for scoring low on civil architecture is not known, but it is possible that there were villages specializing in one or more crafts.

6. *Political Influence and monetized exchange:* Sites in this settlement type have primarily yielded inscriptions issued by the Kshatrapa, Kalachuri and Traikutaka kings and coins by the Kshatrapa, Gupta and Traikutaka kings (Ghosh 1989). This settlement type has very low scores on artefacts and features other than coins and inscriptions. Lack of any excavated site and ancient deposits being covered by modern settlements could account for the low scores on other artefacts.

7. *No type of Influence:* Except for RPW and civil architecture, all the eight sites included in this settlement type have scored low on all artefact types, including those representing the five types of influence. Timbarva, the only excavated site in this settlement type is a small habitation site (0.03 km^2) with a variety of ceramic types, stone and terracotta beads, metal objects, terracotta/stone discs, a seal, miscellaneous antiquities, and remains of a wattle-and-daub house. Though the excavated site has a richer material culture as compared to surveyed sites, it lacks production waste, monetized exchange, sculptures, and permanent structures. Therefore, this group of settlements may be rural habitation sites.

Discussion

Two approaches to the study of evolution of settlements has been made. In the first the concept of urbanism of Childe (1950) has been followed to identify features of urbanism on EHP Phase II settlements in Gujarat. In the second approach settlement complexity has been assessed by assuming that if a site has multiple influences it would imply greater diversity of sub-cultures, economic activities, and occupations, than sites with fewer influences.

The findings suggest that out of five influences argued as important for the evolution of settlements and urbanism in EHP Phase II Gujarat, the influence of monetized exchange and political influence seem to be the most important factors for the evolution of settlement complexity, while the influence of foreign trade-cum- monetized exchange-cum-craft production may be the most important influence for the evolution of urbanism in Gujarat. In future it would be useful to correlate urbanism with settlement complexity and identify the convergences and divergences in terms of the evolution of settlement types.

It is also possible to detect evolutionary patterns among the settlement types. For example, settlement type 1 does not appear to have a rich material culture, though it shares foreign trade with settlement type 2, which has a relatively rich material culture. Therefore, one possibility is that some of the settlement type 1 sites may in due course evolve into settlement type 2 sites. Such a conjecture is also possible *vis-à-vis* settlement types 3 and 4 where again religious influence is common, but the material culture of settlement type 4 is substantially richer as compared to settlement type 3. This would require more excavations and dating before any firm conclusion can be reached.

The lack of any large cluster involving defense influence indicates that unlike Yoruba settlements in Africa, whose developments into large cities depended a great deal on their ability to provide protection to the surrounding populations (Trigger 1972), the defense system or ability of large settlements to protect their surrounding settlements may not have played an important role in the evolution of complex settlements or urbanism in EHP Phase II Gujarat. The only cluster influenced by defense systems consisted of only two sites, namely Bharuch and Shamlaji. Both these sites are associated with influence of foreign trade (Ghosh 1989; Mehta and Patel 1967). Interestingly, therefore, the evidence suggests that the influence of defense systems in Gujarat may have been primarily associated with trading centres rather than with political centres.

The settlement types influenced by foreign trade and religious and monetized exchange were concentrated in Saurashtra and North Gujarat respectively. However, urbanism in EHP Phase II Gujarat, may not have been region-specific, as the settlement type influenced by foreign trade and monetized exchange, which has the most urban attributes, has a wide-spread distribution.

As most of the settlements included in the influence of foreign trade settlement type were within 45 km of modern coastline of Jamnagar District of Saurashtra, and at least one of these settlements has been considered to be a port for Indo-Roman trade. It is quite likely that the influence of foreign trade in this region was through maritime trade. In North Gujarat, the material development of settlements included in the religious and monetized exchange influenced settlement type which may have been influenced by the internal trade traffic, as the major trade route connecting the northern and southern parts of India passed through North Gujarat. This trade route may also have been utilized by large numbers of devotees from Southern and Western India to visit sites in Northern and Central India and also possibly *vice versa* and that these sites in Northern Gujarat may have come up to cater to the religious, rest, and other needs of the devotees.

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Subsistence during the Historic Period in Coastal Orissa

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Abstract

The study of faunal material from three Historic period sites in coastal Orissa: Gaurangapatana, Bardhyakuda and Manikapatana has provided an insight into the subsistence economy comprising both terrestrial and aquatic resources. Information on the exploitation of marine resources is available from the fish bones and marine molluscan shells.

Introduction

In South Asian Archaeology in general, much of the archaeological research concerning coastal sites has focussed mainly on trade, trade goods, ceramics and seafaring techniques, while scant attention has been paid to the nature of food economy which sustained these particular communities. As a result our understanding of their subsistence patterns remains virtually unknown. Evidence shows that the Indian coast has been inhabited since the prehistoric period. There is more evidence during the Holocene especially at the end of the third millenium B.C. Additionally, the presence of fish bones and marine shells at some of the Mesolithic and other Protohistoric sites strongly suggests exploitation of marine resources (Deshpande-Mukherjee 1995; 1998).

It is quite likely that in the past the subsistence patterns of the coastal inhabitants had been strongly influenced by their different activities along with environmental factors. Often due to lack of contact with inland regions and inaccessible terrain there might have been a heavy reliance on marine plant and animal foods. This probably resulted in a complex subsistence economy that included agriculture, animal husbandry, fishing and horticulture. This paper therefore attempts to look at the nature of subsistence on the Orissa coast during the Historic period through the faunal analysis carried out for three coastal sites.

The Study Area

The Orissa coast is a part of the Indian East Coast that lies between the state of West Bengal and Andhra Pradesh covering a distance of 480 kilometres (Fig. 1). This coast is dominated by the deltas of the six river systems, viz. the Subarnarekha, Budhabalanga, Baitarani, Brahmani, Mahanadi and the Rusikuliya. It is narrow in the north, widest in the middle and narrowest in the Chilka lake region. Some characteristic geomorphological features of this coast are extensive alluvial flood plains, natural levees, palaeo-channels, beach ridges, tidal flats, mangrove swamps, spits, bars and lakes (Mahalik 2000). Archaeological investigations in Orissa so far have yielded ample evidence for human occupation since the prehistoric period (Mohanty 1992). However, although Ball had reported on Chowdwar, a kitchen midden site as early as 1876, scarce evidence is available for the Orissa coast (Ball 1876). More focus has been on the prehistory of inland Orissa, Nevertheless, scattered evidence does suggest that in general this coast was occupied from the Mesolithic period onwards. It is the Early Historic period (6th century B.C.-3rd century A.D.), which is well represented, at excavated sites like Sisupalgarh (Lal 1949), Jaugada (IAR 1956-57), Lalitagiri (Chauley 2000) and Manikapatana (Pradhan *et al.* 1996).

In recent years faunal data obtained from a few sites ranging from the Neolithic/Chalcolithic to the Historic period are yielding information on the past subsistence pattern in Orissa. These include Golbai Sasan, Gopalpur, Manamunda, Manikapatana and Khambeswarpally and all indicate a cattle/sheep/goat-based food economy along with the cultivation of rice. Hunting-gathering is evident from the presence of wild animals such as rhinoceros, chital, wild pig and sambhar (Tripathy and Joglekar 1997-98; Kar *et al.* 1998; Mohanty *et al.* 1999; Sinha 2000; Badam *et al.* 2001).

In this paper the south coastal plain mainly the Chilka lake area lying to the north of Rusikuliya delta is being considered (Fig. 1). The Chilka lake is a shallow, brackish

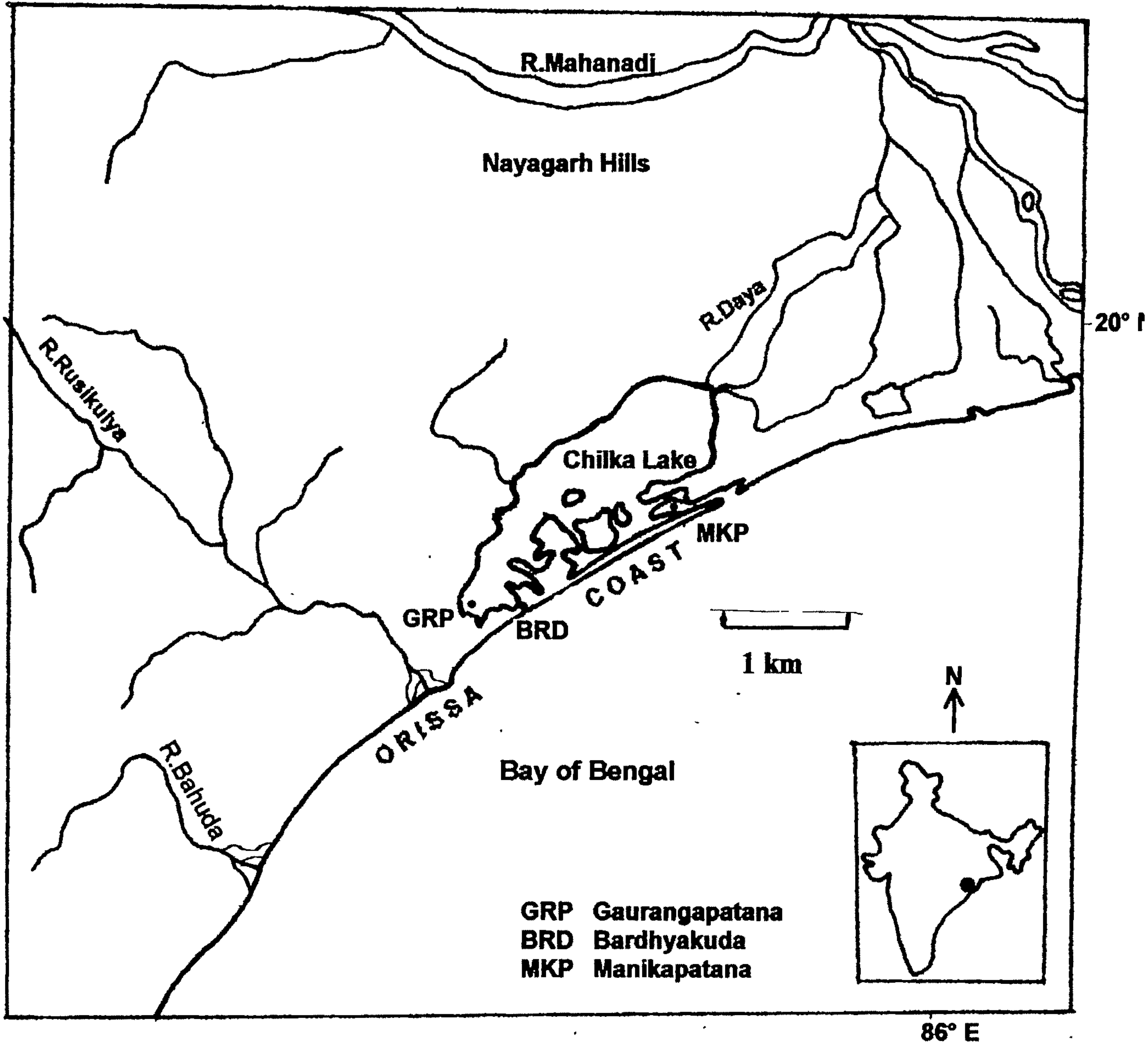

Fig. 1: Map of Orissa showing Chilka Lake

water inshore lake, situated south of Puri District and lying at the southwest corner of Mahanadi delta. Roughly pear-shaped, the lake is 75 km long in NW-SW axis, and maximum breadth is 32 km. The rivers Daya and Bhargavi empty their waters into the Chilka lake. The western and southern margins of the lake are bordered by the Eastern Ghat ranges. It is separated from the Bay of Bengal by a belt of about 4 km wide sandy beach ridges and barrier spits lying to the east of the lake. Chilka is divided into an outer channel with a narrow mouth leading to the sea, and the main body of the lake with a muddy bottom rich in organic matter (Senapati and Kuanr 1977).

The modern aquatic fauna of Chilka is unique because of the varying salinity in different parts of the lake. It hosts a wide range of animals from planktonic micro-organisms, sponges, coelenterates, leeches, turtles to a vast variety of fish which together sustain the enormous wintering bird population. A flourishing fishery, exploiting crustaceans, molluscs and fish is the mainstay of the local population.

A systematic survey carried out by Basa and others in the region south of Chilka Lake around the Palur and Rhamba palaeoharbours has brought to light many important settlements (Mohanty *et al.* 1999). The two palaeoharbours Palur and Rhamba are situated close to

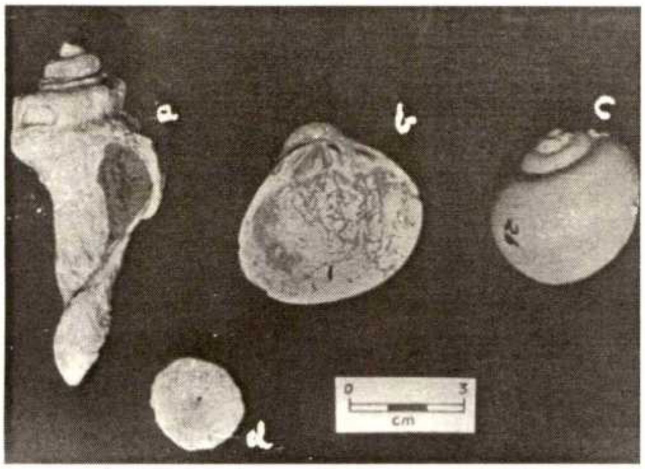

Fig. 2: a. *Pugilina buchephala* b. *Meretrix casta* c. *Pila globosa* d. Fish vertebrae

each other and are to the immediate north of the Rusikuliya estuary (Fig. 1). The earliest reference to Palur as a port has been made by Ptolemy during the 2 century A.D. (Gereni 1904). Small-scale excavations carried out at the three sites Bardhyakuda, Gaurangapatana and Manikapatana in these two ancient harbours has yielded fish bones, marine shells, animal bones along with other cultural material. This faunal material was studied at the Archaeozoology laboratory of the Deccan College Pune.

Table 1: Shell measurements from Bardhyakuda

R. No.	Species	Side	Length (mm)	Breadth (mm)
12	*M. casta*	L	28.88	24.74
13	*M. casta*	R	35.45	32.69
14	*M. casta*	L	38.89	35.05
15	*M. casta*	L	27.83	26.59
16	*M. casta*	L	25.52	20.87
17	*M. casta*	L	41.82	44.34
18	*M. meretrix*	L	23.52	19.77
17A	*T. telescopium*	–	42.96	23.35
18a	*T. telescopium*	–	37.78	20.59
19	*T. telescopium*	–	51.98	29.03
20	*T. telescopium*	–	(40.13)	24.48
21	*T. telescopium*	–	33.60	15.23
22	*T. telescopium*	–	28.82	15.53
23	*T. telescopium*	–	00.00	(43.76)

L = Left; R = Right; ( ) indicates an estimate

The Sites

Bardhyakuda (BRD)

Bardhyakuda was an Early Historic and Medieval settlement in the ancient Palur harbour complex close to the modern Palur and Arunapur village (Fig. 1). The site is roughly rectangular and covers an area of 2,500 m^2. The northern and western part indicate that the total habitation deposit varies between 0.6 and 1 m. The site has yielded a wide range of ceramics (Black-and-Red ware, Lustrous Red Polished ware, Black Slipped ware and coarse fabric globular cooking vessels) and large number of potsherds with a single perforation. These perforated sherds are confined to coastal sites. The other material remains are a bifacial bone point, a perforated disc, iron slag, stone discs and bone beads probably made from locally available fish vertebrae. Similar objects are reported from the Chalcolithic level at Golbai Sasan (Sinha 2000). Besides these, a number of animal bones belonging to terrestrial habitat, along with marine shells have been found. Species identified include cattle, sheep/goat, dog, pig and chital/deer and show good preservation (Mohanty *et al.* 1999). Some of the bones especially those of cattle show cut-marks and charring.

A total of 28 marine molluscan shells were studied, out of which 14 were measurable The shell remains belong to five species, all are marine estuarine in origin. (Table 4). Among these, the conical gastropod (*Telescopium telescopium*) was predominant and had an average length of 33.61 mm (Table 1) Out of sixteen *Tetelescopium* shells only seven shells were complete and two showed charring. The rest of the shells show breakage in their apical region. Six complete shells of the venerid clam *Meretrix casta* are also present. These shells do not exhibit any sign of modifications and have a chalky white appearance (Fig. 2b). Two species of oysters are found together. *Crassostrea madrasensis* is larger and broader and *Crassostrea cucullata*, is smaller and cup like with a crenulate margin (Fig. 3a). They are present as clusters of three or more and

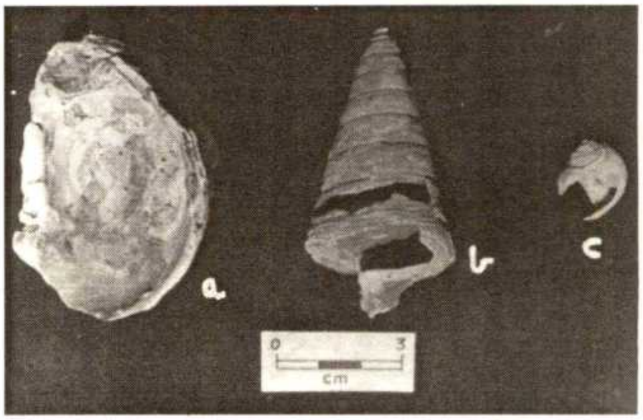

Fig. 3: a. *Crassostrea madrasensis* b. *Telescopium telescopium* c. *Natica* sp.

attached to sandstone pebbles. Their outer surface shows pitting and presence of barnacles. The small gastropod *Cerithidae cingulata* is represented by one complete shell. No shell objects have been studied except for one bangle fragment made from *Turbinella pyrum*, which is plain, simple and rectangular in cross-section having a width of 1.2 cm.

Fish bones comprise 5 vertebrae, 11 spines and a fragment of cranium. No species identification could be done but these are of marine origin. Presence of crustaceans like crabs is attested by the occurrence of their pincers (8).

Gaurangapatana (GRP)

Gaurangapatana is located in the Rambha harbour, to the north of the Palur and the southern fringe of the Chilka Lake (Fig. 1). It lies at the foot of the Ghantasila and Nandighar hill ranges. A small scale excavation of two trenches (2 m x 2 m) was carried out at Gaurangapatna (Mohanty *et al.* 1999). The trenches GRP I and GRP II revealed a cultural deposit of 60 cm and yielded a variety of pottery consisting of Dull Red ware, Red Slipped ware and Black Slipped ware. The excavation has also yielded Indo-Pacific glass beads, ornaments made from fish vertebrae, iron objects and a copper fragment. Features like post-holes and hearths containing ash have also been revealed. A significant find from the surface is a broken boat motif, implying a sea going vessel. The motif is associated with a circular stamp, which could belong to a guild. The other surface finds include terracotta beads, terracotta hopscotch's and spouts (Mohanty *et al.* 1999). Faunal remains mainly consisited of fish, reptiles, crustaceans and molluscs out of which fish and molluscs are more (Table 2).

Table 2: Faunal taxa from Gaurangapatana

	Faunal Taxon	**NISP**
I	FISH	256
II	MOLLUSCS	
	(1) *Pugilina buchephala*	1
	(2) *Meretrix casta*	52
	(3) *Meretrix meretrix*	1
	(4) *Paphia* sp.	1
	(5) *Anadara granosa*	5
	(6) *Pila globosa*	3
	(7) *Cerithidae cingulata*	1
	(8) *Turbinella pyrum*	1
	(9) *Moneta moneta*	1
	(10) Gastropod unidentified	1
	(11) Bivalve unidentified	1
III	CRUSTACEANS	
	(1) Crab	1
IV	REPTILES	
	(1) Turtle	1

NISP: Number of Identified Specimens

Fish

A total of 256 fish bones were recovered and tentatively identified as marine. Fish remains are mostly represented by spines and vertebrae, which are quite small in size. Some of the fish bones show charring.

Molluscs

A total of 68 marine shells were recovered. Out of these only 10 shells were measurable. The shells have a chalky appearance and show signs of chemical dissolution. In spite of being a small sample, 11 species mainly belonging to marine estuarine habitat, are present. *Meretrix casta* is the most predominant species (52). These shells are mostly fragmented. Ten shells are present with their umbo region intact while broken in their peripheral margin. The breakage appears to be old probably at the time of their discard. Very few shells show signs of charring or burning.

Only one shell of *Meretrix meretrix* was found. This shell, which closely resembles *M. casta*, is not very common on the East Coast. It is more abundant on the West Coast, where it is regularly collected.

Five complete shells of *Anadara granosa* have been found (Fig. 4). Their average length is 64.56 mm and breadth 58.37 mm (Table 3). Three shells show breakage along their margins, which is also an ancient breakage. None of these shells show any sign of modification. One complete cowry shell identified as that of *Moneta moneta* or money cowry is present (length 12.64 mm and breadth 9.06 mm).

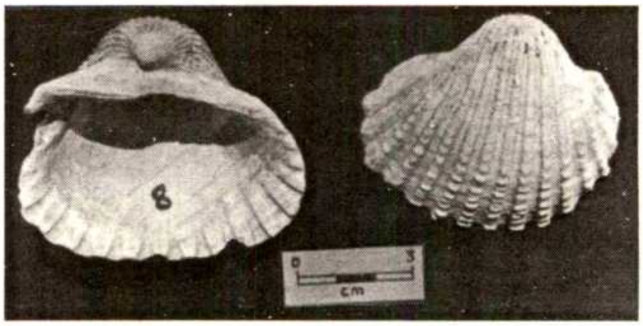

Fig. 4: Shells of *Anadara granosa*

Table 3: Shell measurements from Gaurangapatana

R. No.	Species	Side	Length (mm)	Breadth (mm)
26	*Pila globosa*	-	41.76	29.19
4	*Meretrix casta*	R	00.00	37.11
5	*Meretrix casta*	R	00.00	26.19
1	*Meretrix casta*	L	48.21	44.29
2	*Meretrix casta*	L	00.00	37.87
3	*M eretrix casta*	L	41.60	35.02
6	*Anadara granosa*	R	(67.40)	57.67
9	*Anadara granosa*	R	66.97	56.88
8	*Anadara granosa*	R	69.31	60.58
7	*Meretrix casta*	L	57.25	(52.64)

L = Left; R = Right; ( ) indicates an estimate

Rare occurrence of freshwater molluscs in the collection is notable as only three shells belonging to *Pila globosa* or apple snail, a freshwater gastropod were found (Fig. 2c).

Apart from shells, no shell debitage or objects signifying shell working have been studied. However a columella belonging to the large marine gastropod *Pugilina buchephala* is present (Fig. 2a). It has a length of 86.16 mm. Its main whorl is broken and the shell looks weathered.

Animal bones recovered with shells are comparatively few. These mostly comprise splinters of long bones and dental parts of large mammals such as cattle. From GRP. II two bone points were recovered. These appear to have been made from the shaft of a long bone and one of them has been fire hardened.

Manikapatana (MKP)

This site is located in the Brahmagiri Tehsil, 45 km to the southwest of Puri town on the left bank of a channel which connects the Chilka lake with the sea (Fig. 1). Small-scale excavation carried out by the Institute of Maritime and Southeast Asian studies (1989-90, 1992-93) and the Department of State Archaeology, Government of Orissa, revealed Manikapatana to be a flourishing port from the Historic to Medieval times (Pradhan *et al.* 2000). The site has been disturbed a great deal due to seasonal flooding at high tide.

Trial excavation revealed two phases of occupation during the Early Historic and the Medieval periods. It yielded ceramics such as rouletted ware, Arabic ware, Kaolin ware, Chinese porcelain, Celadon ware, stamped ware and decorated ware. A sherd with a Kharoshti script and a Puri Kushana coin indicate that the site was occupied from the first century A.D. Other finds include terracotta beads, iron heads, bangles, conches, semiprecious stone beads, ringwells and burials (Pradhan *et al.* 2000). Besides these, a number of fish hooks and harpoons were also recovered.

Table 4: List of molluscs found at Bardhyakuda (BRD), Gaurangapatana (GRP) and Manikapatana (MKP).

Species	BV/G	BRD	GRP	MKP
Meretrix casta	BV	5	52	-
Meretrix meretrix	BV	1	1	-
T. telescopium	G	16	-	8
Anadara granosa	BV	-	5	-
Cerithidae cingulata	G	1	1	10
Natica sp.	G	-	-	1
Crassostrea sp.	BV	1	-	1
Crassostrea cucullata	BV	4	-	2
Pugilina buchephala	G	-	1	-
Pila globosa	G	-	3	-
Paphia sp.	BV	-	1	-
Turbinella pyrum	G	-	1	-
Moneta moneta	G	-	1	-
Unidentified shell	G	-	1	-
Unidentified shell	BV	-	1	-
	Total	28	68	22

BV: Bivalve; G: Gastropod

A few shell remains (22) studied have gastropods — *Telescopium telescopium* (Fig. 3b) and *Cerithidae cingulata* (Table 4). The shells of both these species show varying degrees of deterioration. The whorls have been partially lost leaving behind only the sutures and the columella. Here also, like Bardhyakuda the shells have a chalky appearance.

Discussion

The faunal assemblage although being a small collection presents a wide representation of fauna ranging from mammals to invertebrates. Presence of cattle bones and that of wild animals like deer, turtle reveals that animal husbandry was practiced alongside hunting and gathering. Parallel exploitation of marine fauna is evident from the fish and shell remains.

Fishing appears to have played a significant role in the life of the people at all the above mentioned sites as indicated by the presence of fish bones and fishing gear like harpoons and fish hooks. Fish bones as compared to other faunal remains are fragile and poorly preserved. It is mostly the vertebrae and spines which remain intact. Hence determining fish consumption from a few fish bones becomes difficult and could be misleading. However taking into considering the large-scale fisheries being carried out today along with the archaeological evidence, it is assumed that fishing had been an important activity during those times. Fisheries were probably of three kinds as is practiced today, i.e. freshwater, estuarine and sea fishing. For this the nearby estuaries and open seas had served as potential fishing grounds for the coastal inhabitants. Fish like the pomfret, sole, prawns and sardines are some of the common varieties fished on the Orissa coast today (Senapati and Kuanr 1977). Further use of fish vertebrae for making ornaments indirectly indicates use of discarded fish bones.

Besides regular fishing, collection of invertebrates like crustaceans and molluscs was also a part of the local subsistence economy. Exploitation of marine bivalves and gastropods was mainly for dietary purpose. Accumulation of their shells discarded after consuming the meat resulted in the formation of shell-bearing deposits. Such types of deposits have rarely been reported on the East Coast of India.

From the species identified at the three sites it is inferred that shellfish gathering was done in inter-tidal areas along the shore and in sandy mudflats in the nearby estuary. The Rusikulya estuary located close to these sites today provides a variety of marine resources. A few select molluscan species were collected amongst which most common were the two bivalves — *Meretrix casta, Anadara granosa* and gastropod *Telescopium telescopium* (Table 4). In present times these species form major shellfisheries in estuaries and backwaters on the East Coast where water is saline throughout the year (Hornell 1917; 1951). While *Meretrix casta* is a popular dietary resource, *Anadara* is specifically collected for lime manufacture. With the help of archaeological evidence from the West Coast in Gujarat it has been possible to trace the antiquity of their exploitation to as early as the third millenium B.C. (Deshpande-Mukherjee 1998).

Today *Meretrix casta* which has a thicker shell with a more pronounced umbo than that of *Meretrix meretrix* is mainly collected during the hot summer months (March - July) when water level is low and collection is easy (Abraham 1953). Shellfish gathering could have been a year-round activity as is done on the East Coast in present times. Their collection generally requires very simple methods like handpicking at low tide. Presence of fairly big sized shells suggests that good quality mature individuals were procured. On the Tamil Nadu coast these clams are fished before they reach a size of 30 mm. *Anadara* shells found at Gaurangapatana are large in size and occur as nearly complete shells. They are larger than the size to which they grow today. On the same coast at Kakinada today, *Anadara* shells grow to a size of 49.5 mm at the end of two years. It is specially favoured by pregnant women for its rich iron content (Nayar and Mahadevan 1974).

Shell processing for extracting meat was done at the sites and had involved simple methods like shell breakage, boiling and steaming. In the case of *Meretrix casta*, shells could have the umbo region intact. This is a very hard shell, which generally does not break easily due to natural factors. In the Adyar and Ennore estuaries in Tamil Nadu, women collectors gather the clams and pile them in heaps on the mud banks. Meat extraction is done by breaking the shells with granite stones and the meat is scooped out with the thumb. The meat is then collected in earthen pots while the shells are left behind (Nayar and Mahadevan 1974). Shell breakage resulting from meat extraction is also visible in *Telescopium* shells found at Bardhyakuda and Manikapatana. These were found with their apex broken. The method of breaking the apex for extracting the meat is frequently used by the aborigines of Anbarra land in Australia (Meehan 1982). Similar breakage has been observed for the *Telescopium* shells from the Harappan sites of Kuntasi and Lothal in Gujarat (Deshpande-Mukherjee 1998). Absence of charring on the shells suggests that probably processing methods like roasting or heating were seldom used.

Besides clam collection, there is limited evidence for the collection of the large oyster *Crassostrea madrasensis* and small oyster *Crassostrea cucullata*. It is possible that processing of these particular oysters was done at the site of procurement itself hence their poor representation. Ethnographic evidence from the west coast shows that in the case of *Crassostrea cucullata*, shells are seldom transported due to difficulty in detaching them from rocky exposures. Similar is also the case with larger oysters. (Deshpande-Mukherjee 2000). Therefore here limited representation of oysters does not necessarily indicate their lack of collection. In present times nearly five *Crassostrea* species are extensively exploited along both East and West coast of India (Mahadevan 1987).

Presence of the small gastropod *Cerithidae cingulata* in the collection suggests accidental introduction. These are small conical gastropods inhabiting tidal mudflats in large numbers where they can be observed crawling about. They prey upon clams and oysters with which they are commonly associated.

There is no evidence for the collection of freshwater shellfish except for the gastropod *Pila globosa*. This could hint at the collection of freshwater molluscs too at Gaurangapatana. *Pila globosa* is a fairly large globose gastropod found commonly in ponds and lakes in like West

Bengal, Assam, Orissa and Manipur where it is widely eaten (Subba Rao 1989; Deshpande-Mukherjee personal observation).

Empty shells of clams and oysters could have been further used for making lime after being discarded. In modern times lime manufacture from shells is carried out on both the East and West Coast. This lime is specifically used for whitewashing houses.

In spite of the evidence for the utilisation of various animal resources their exact contribution to the dietary pattern is difficult to determine due to lack of quantification and limited nature of excavations.

Apart from dietary use, a fair amount of shell working is evident in the form of debitage and shell objects like shell bangles. Two types of shell bangle fragments were obtained from Gaurangapatana. One is plain having a width of 6.86 mm while the other is broader (14.38 mm) having ridges. Conch shells are present at Gaurangapatana and Manikapatana, which probably are of *Turbinella pyrum* (Basa and Behera 2000). This species is found inhabiting sea beds along the Tamil Nadu and Gujarat coast. Procurement of this shell might have been from either of these two regions, as it is not found locally on the Orissa coast. Occurrence of a single columella of the marine gastropod *Pugilina buchephala* also indicates similar procurement areas. By the Historic period in the Indian Subcontinent, use of these two shells for the manufacture of bangles, beads and inlay was a common practice. However later on shell bangle manufacture declined in most parts of India but continued in West Bengal (Kenoyer 1983; Deshpande 1995). Due to the location and importance of all these sites as ports and trading centres they had probably witnessed the manufacture and trade of shell objects as well.

Although fishing and shellfish gathering activities could be reconstructed from the available evidence it is difficult to identify their socio-economic status of the people involved in it. Present-day observations show that fishing communities apart from fishing as a major activity also carry out shellfish gathering as a side activity. However, it is mostly carried out by people belonging to economically backward classes with women and children being major contributors (Deshpande-Mukherjee 2000). Hence shellfish collection is generally considered as a low status activity even though shellfish is relished as a food by the majority of the coastal folk. In the Historic period, rigid caste system, social stratification and religious attitudes might have isolated some of communities involved in lesser important activities like shellfish gathering. While importance may have been attached to fishing, chank and pearl fishery as evident from Kautilya's Arthshastra (Shamasastry 1956), molluscan collection for dietary use was probably considered less important. Therefore shellfish gathering may have remained an insignificant occupation.

Besides inferring the cultural role of the marine shells at these sites, it has been possible to obtain from them appreciable information on the environmental conditions prevalent at the time of their collection. This has helped to identify their collection areas as well as reconstruct the nature of the shoreline in the immediate vicinity of these sites. From the presence of clams and oysters like *Meretrix*, *Anadara* and *Crassostrea*, two types of habitats have been inferred:

a) estuarine and backwater areas with their soft sandy/ muddy substratum's. These areas near river mouth are under the influence of daily tides and their water salinity varies according to the season. Such areas are ideal for the growth of different types of molluscs, crustaceans, etc. Most of the estuarine and backwater bivalves require clear water with minimum silting. *Anadara* species generally grow in subtidal muddy sands in low wave energy environments with high water flow. Since salinity is less as compared to open seas, destructive effects of bioeroders like barnacles, sponges, etc. is much reduced thereby enabling good growth of clams and oysters. Oysters from such environment are large as compared to the small irregular shaped ones from open seas. The oysters at Bardhyakuda from their fairly large size have been identified as procured from estuarine areas. The gastropod *Telescopium telescopium* indicates presence of Mangroves which are commonly associated with similar environments and,

b) a rocky intertidal zone where rocks exposed at low tide provided the small oysters *C. cucullata* and other smaller gastropods. These molluscs are characteristic of rocky open coasts and can endure high temperatures where salinity is high. Further occurrence of barnacles on the surface of some of these oysters indicates high salinity since barnacles and other organisms are active under such conditions.

The overall presence of fairly large sized shells of *Anadara* and *Meretrix casta* indicates the availability of favourable conditions for the growth of good quality shells during those times. This suggests that moderate salinity, presence of large sheltered water bodies, absence of silting and parasitic organisms provided an ambient environment for the shell beds of these species to thrive. It is observed that factors such as lowering of salinity, destruction by storms, frequent exposure to sun, silting, pH etc. cause large-scale destruction of shell beds. In Australia in early 1970s a heavy monsoon destroyed shellfish beds of *Tapes hiantina* in the Northern territory. As a result the Anbarra aborigines who largely depend on shellfish resources had to make changes in their foraging strategies (Meehan 1982).

Comparison of the archaeological shells with those of the present-day from the same region display similarities in species representation. This in a way suggests that there have been no drastic changes in the coastal ecology from the Historic to the present times.

Archaeological molluscs are in recent years also used in reconstructing the post-depositional history of sites. These can give information on the kind of processes active on archaeological sites. Although the shells have accumulated mainly due to cultural related activities these display good preservation. No human modifications like perforation, abrasion or charring are observed on the shells except for shell breakage. The shells have acquired a chalky white appearance, which is probably due to exposure to various natural weathering agents caused by post-depositional disturbance. In present times shrimp farming at Bardhyakuda and inundation at Manikapatana is causing ample damage to sites. Fragmentation and shell dissolution are the commonly observed effects of post-depositional disturbances such as trampling, mining and reclamation. Shell dissolution is visible in the case of *Telescopium* shells at Manikapatana where shell whorls have lost their shell material.

Conclusion

Occurrence of molluscan shells and fish bones at all the three sites suggests the contribution of marine resources to the food economy during the Historic period. This practice continued into the medieval times as indicated from Manikapatana. Molluscan shell study reveals a mixed nature of subsistence on the Orissa coast. It comprised agriculture, animal husbandry, hunting of wild game, fishing and shellfish gathering. Environmental information inferred from the molluscs reveals the presence of favourable ecological zones. These consisted of freshwater bodies, river mouths, intertidal areas, estuarine tidal flats and mangroves. As a result a wide variety of terrestrial and aquatic food resources was readily available. This in a way reflects the diverse subsistence pattern adopted by the coastal inhabitants besides being actively involved in other maritime activities. The sedentary nature of the settlements and their participation in coastal trade is indicated through the presence of different ceramics and other artefacts. This may have encouraged an year-round marine resource exploitation since by this time majority of the shoreline communities were aware of their immediate environment and its resources. This knowledge was probably acquired through the ages thereby making it easy for the people to exploit the resources easily.

Fishing was one of the major occupations of the people at all the three sites while shellfish may have served as an year-round secondary resource. Continued utilisation of the species like *Anadara, Meretrix casta* and *Crassostrea* on the East Coast in modern times helps us trace their economic importance as early as the Historic period. It also hints that no drastic ecological changes have occurred along the coast as similar molluscan fauna continues to inhabit this region even today. Identification of marine molluscs in the diet is significant as it has helped understand the contribution of such lesser important food resources which otherwise would never have been learnt about.

To conclude the overall faunal study in spite of its limited nature has helped provide clues to the nature of human adaptation on the Orissa coast during Historic and Medieval times. It has shown that availability of a wide variety of food resources at all the three sites had made them ideal for habitation. This had encouraged coastal activities and indirectly helped them to flourish.

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Newly Discovered Rock Paintings, Ancient Stone Quarry and Painted Brahmi Inscriptions in District Chandauli (U.P.)

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Abstract

This paper reports the discovery of an important archaeological site, comprising of painted rock-shelters, an ancient stone quarry and early Brahmi inscriptions, located in the Vindhyan foothills, to the southeast of Varanasi. These finds suggest a comparative chronology for the rock paintings. The ancient stone quarry appears to be on the ancient route from Pataliputra to Varanasi. The presence of Brahmi inscriptions in a non-administrative context shows that fairly broad groups of people were literate by c. 3rd–2nd century B.C.

Background of the Discovery

The Brahmi inscriptions discussed in this paper came to light in the month of January 2001. They were discovered during a trekking visit to Chorhari hillock, on the Chakia-Sherwan-Bhuili-Adalhat road, by Ravi Kumar Maurya, and a friend. The friend, being a student of history, noted the inscription, and later it was brought to the notice of the second author, a close acquaintance to Ravi. Subsequently, considering the apparent significance of the evidence, exploration of the locality was taken up along with Ravi.

Location of the Find Spot

The hillock on which the inscriptions in question are found is to the south of Bhatwara Khurd village, marked as 'Chorhari Reserved Forest' on the Survey of India Topographic Sheet No. 63 O/4 (25° 04' 31" N; 83° 09' 28" E). It is about 120 m AMSL. Village Bhatwara Khurd lies in the Chakia tehsil of the newly formed District Chandauli carved out of the old Varanasi District. It is easily approachable by road from Varanasi via Adalhat, which is located on Varanasi-Robertsganj-Renukoot road (Fig. 1).

Description of the Site and its Remains

The exploration of the Chorhari hillock showed numerous small and large broken stone blocks all along the northern portion on the top slopes of the same side. The chisel marks on the highly weathered upper edges of these blocks appear to be of considerable antiquity (Fig. 2). Some of the cylindrical monolithic blocks are found lying in situ at the spots from where they have been hewn (Fig. 3). The length and radius of these blocks vary between 1.90-2.10 m and 0.90-1.05 m, respectively. The measurements of three of them are 1.9 x 0.9 m for a partly broken one, and 2.05 x 1.05 and 2.10 and 0.90 m for two unfinished ones. The first measurement is the length and the second the radius of the blocks.

The upper edges of the rocks from which stone-blocks were hewn out bear chisel marks. Some of the locations show only the rocks with such marks, indicating that the blocks have been transported away. At one location, only the chisel marks are seen on the rock surface but for some reason it is left as it is. At another location two circular post-holes have been noticed on a rock surface near a broken cylindrical stone-block lying in situ, measuring about 16 cm in their radii. It appears that most probably the posts were placed there to support some form of covering to provide shade, during the hot summer days.

Abundant chisel marks, evident on the rocks of the northern edge of the hillock, amply testify that the present cliff or *kagar* would not have been as straight in the past as it is at present. Stone blocks have been cut from these rocks for a long time; steepening the cliff. The blocks hewn out of the top of the hillock were given cylindrical shape to facilitate the process of their transportation by rolling them down the slopes. It appears that at least in the northern portion such blocks were being directly pushed down. A number of broken blocks, lying on the hillside indicate the possibility of such a practice. Many of them are presently being worshiped as 'pious rocks'. One of the larger blocks has been installed as a deity a shelter. The priest of this makeshift temple and local people apply *sindur* (vermilion) on the rock being worshipped as a deity. Several other *sindur* applied rocks are also lying scattered in the vicinity of this makeshift shelter. A large portion of the hillock has been esteemed as the sacred place for the worship of a deity, locally known as *Devi ji-ka-sthan.*

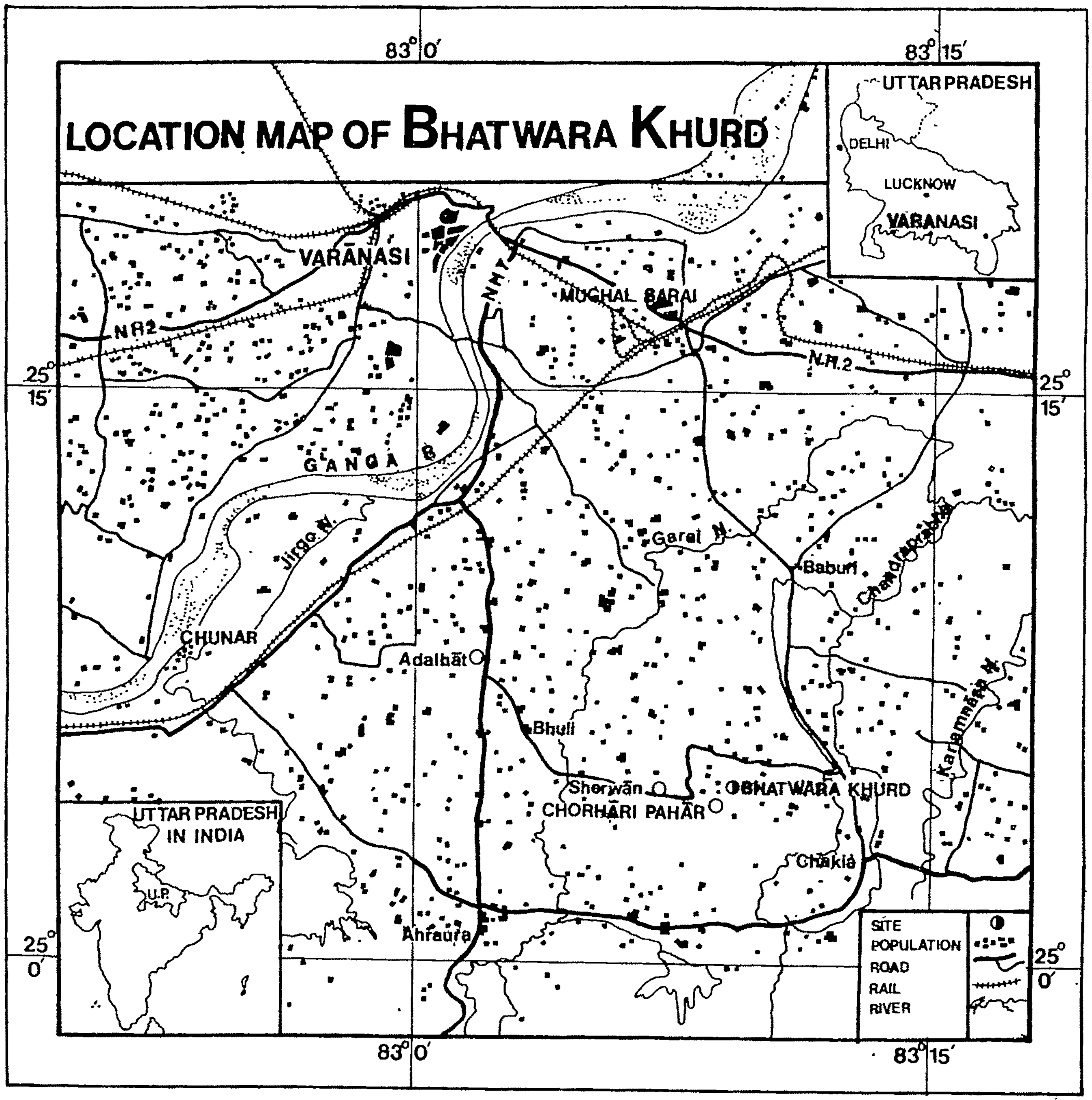


Fig. 1: Location map of Bhatwara Khurd, Dist. Chandauli, U.P.

Several small to medium sized natural sandstone rock-shelters are located in the upper portion along the northern cliff of the hillock. These shelters are roughly about 2.00-5.00 m in extent, 2 m broad and about 1.5-2.00 m in height. Some of them have paintings on the rock surface of their inner walls and ceilings. The paintings are executed mostly in red ochre of various shades. In a few of them use of white pigment is also evident. The compositions include human and animal figures, hunting scenes, *alpana* designs, etc. Some of them are executed in 'x-ray style', while others are represented in linear forms or by filling the outer frame of the figure with colour (Figs. 4-5).

Interestingly, two small inscriptions in Brahmi script are painted in one of the rock-shelters located almost in the middle of the upper ridge of the cliff. The composition in which these inscriptions are painted also contains two elephant figures and some unidentifiable motifs overlapping the elephant figures (Fig. 6).

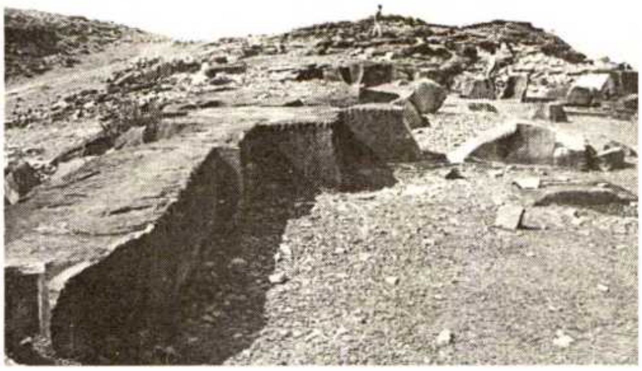


Fig. 2: Chisel marks on the highly weathered upper edges of the rock located on the top of the Chorhari hillock, Chorhari hillock

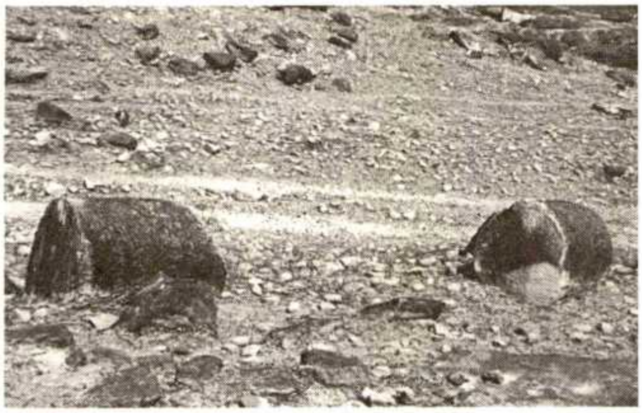


Fig. 3: Cylindrical monolithic block lying *in situ* on the spot from where it has been hewn out, Chorhari hillock

The elephant, with raised trunk facing right, depicted in the beginning of the first inscription, measures about 8.00 cm in height and 25 cm in extent. Following the elephant figure, this 19 cm long inscription includes 9 letters of about 2.00 cm in height. However, the largest letter 'SRI' or 'SHI' goes up to the height of about 2.50 cm. This inscription may be deciphered as follows:

SA HE SRI VA NE VA KE TA KE

(SAHE SRI VANEVA KETAKE)

OR

SA HE SHI VA NE VA KE TA KE

(SAHE SHIVA NEVA KETAKE)

OR

SA HE SHI VA NA VA KE TA KE

(SAHE SHIVA NAVA KETAKE)

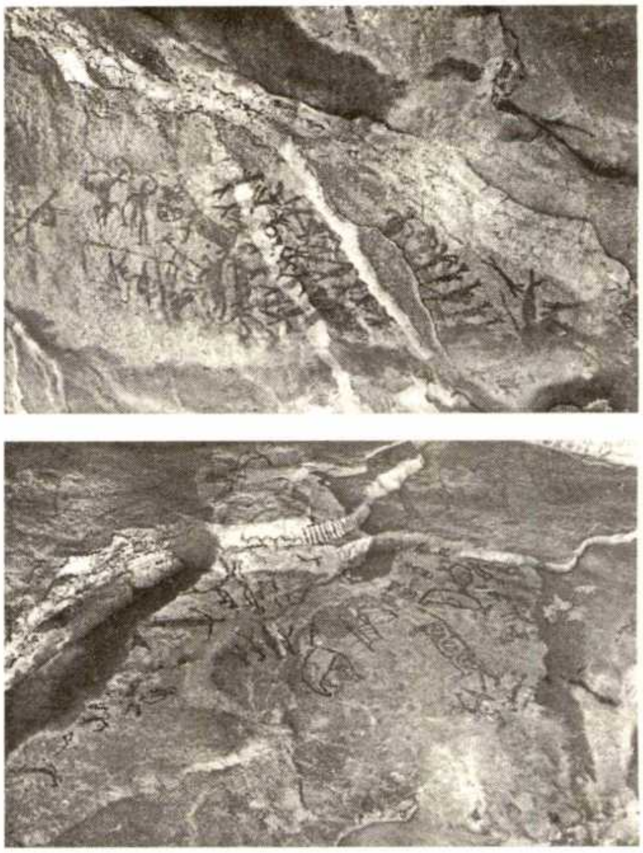


Fig. 4: Rock paintings depicted in ochre colour, Chorhari hillock, Digs depicted in ochre colour

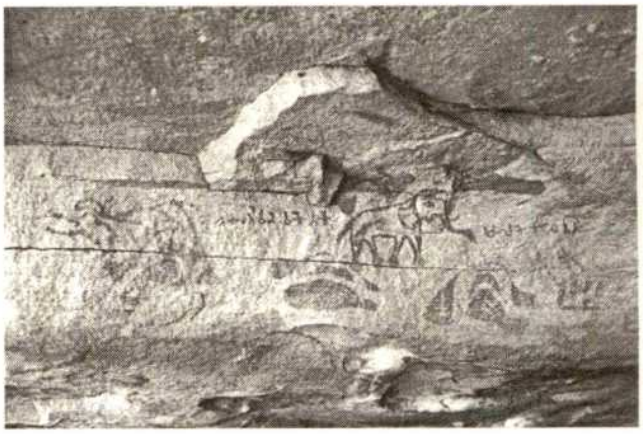
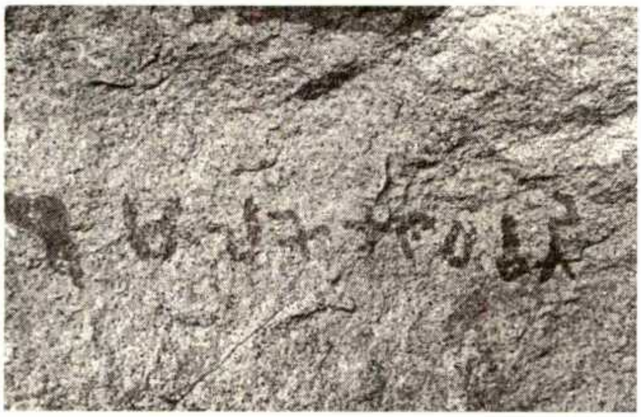


Fig. 5: The composition consisting of two Brahmi inscriptions along with two elephant figures and some unidentifiable motifs overlapping them, Chorhari hillock

The above inscription put to an end with another elephant figure facing left, which measured about 13.00 (height) x 24.00 cm (extent). Another inscription comprising of eight letters of almost the same size as of the earlier ones mentioned above follows this elephant figure, extending to about 18.00 cm. This may be deciphered as follows:



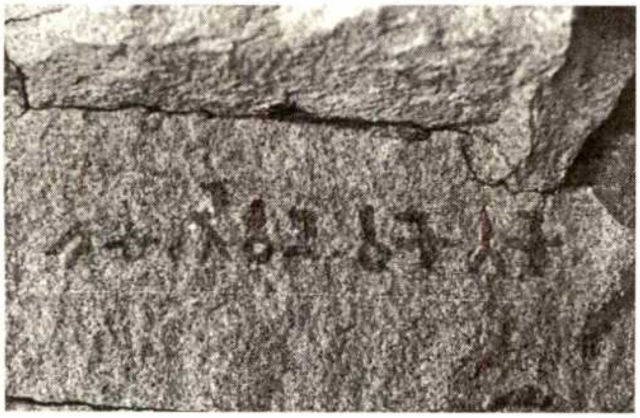


Fig. 6: a) Close up of the second Brahmi inscription, Chorhari hillock, Dist. Chandauli, U.P.; b) Close up of the first Brahmi inscription, Chorhari hillock, Dist. Chandauli, U.P.

MA LA KE KA TA DHI VA TI

(MALA KEKATA DHIVATI)

The language of the inscriptions is Sanskrit. As far the antiquity of these inscriptions is concerned scholars, whom we have consulted, are of varied views. Most of them, on stylistic considerations of the letters, are in favour of placing these inscriptions in 2nd century B.C. Others, on the same basis, put them still earlier in c. 3rd century B.C. The literal meaning of the texts is not clear.

On the basis of superimposition and style of depiction, the rock paintings of Bhatwara Khurd may broadly be placed in four phases. Two of them are earlier to that of the Brahmi inscriptions. Paintings in the earliest phase are lighter in colour, revealing human and animal figures. The next phase is characterised by the painting of a hunting scene in which a deer depicted in 'x-ray style' and is shown being hunted by an archer. Its associated paintings are executed in a darker colour. Figures of elephants enumerated above with the inscriptions denote the third phase. Some unidentifiable depictions partly overlap the elephant figures. The depictions portrayed by filling paint within the frame of the figures, human figures with triangular body and the paintings depicted in white colour are clearly later than the inscriptions and fall in the last fourth group.

Painted inscriptions provide a benchmark to suggest a tentative chronology of the rock paintings of the rockshelters in question as well as the region concerned. On this basis the rock paintings depicted in the style as of elephants shown with the inscriptions, may be considered contemporary to the inscriptions on comparative grounds. Hence, these may safely be placed somewhere around 3rd–2nd century B.C.

'X-ray style' and hunting scene, seem to be of the Chalcolithic period, if not earlier. The paintings of the fourth phase would obviously be later than the third phase and belong to a period beginning from the early centuries A.D., terminating in the recent times.

Discussion

Rock paintings in a large number are not only known from the hillocks situated around Bhatwara Khurd in particular, but also from the sandstone shelters of the eastern Vindhyas or Kaimur hills in a wide region (extending over Mirzapur, Sonbhadra and Chandauli districts of Uttar Pradesh and Rohtas and Kaimur districts of Bihar) in general (Tewari 1990; 1998, Prasad and Anand 2001). Bhatwara Khurd rock paintings have now significantly added to our existing knowledge about the cultural history of the region. More importantly these paintings are associated with early Brahmi inscriptions, which places some reliable constraints on dating of rock-paintings, at least in the regional context.

It is worthwhile to mention here that the famous Ahraura minor rock edict of Ashoka, inscribed on the top of Bhandari Devi pahar, is about 12 km (as crow flies) from Bhatwara Khurd. A habitation site, datable to at least NBPW period onwards, also exists to the southwest of the Bhandari Devi hillock (Tewari *et al.* 1999). Ahraura is a well-known junction on the crossroads to the Vindhyan Plateau in the south, Chunar in the west, Varanasi in the north and Pataliputra in the east. Notably, the route coming from Pataliputra via Nindaur (Singh *et al.* 2000) in Bihar towards Varanasi onwards may have bifurcated into two main tracks, one along the Ganga via Prahladpur, and second one across the Karamnasa. A second route would have further followed at least two sub-routes, first leading to Ahraura via Mubarkpur, onwards, and second to Varanasi via Bhatwara Khurd and Bhuili, etc.

Chorhari hillock of Bhatwara Khurd village is located on the second route, which is also the modern one, and would have been in a commanding location along this route to Varanasi. The inscriptions on this hillock and also NBPW and other early remains at Bhuili (Tewari *et al.* 1999: 186), convincingly corroborate this surmise.

The quarry of large stone blocks, recently discovered around Baragaon village, about 3-4 km south of Chunar in district Mirzapur (Jayaswal 1998), is also worth mentioning in the present context. Here, a large number of cylindrical or circular stone-blocks bearing Mauryan Brahmi, early Kharosthi and later inscriptions, are lying in situ and in a scattered state. Taking into consideration the inscriptions, the antiquity of the stone quarry has been placed in 3rd century B.C., which would have continued till Late Medieval times (Jayaswal 1998: 213). Stone-blocks around Baragaon exhibit conformity in their shape and size to those of the Bhatwara Khurd quarry. Further, similarities of early Brahmi inscriptions in one of the rock-shelters at Bhatwara Khurd with those from the Baragaon locality, is also significant in establishing the early antiquity of the Bhatwara Khurd stone quarry to 3rd-2nd century B.C., continuing until the Late Medieval period. Circumstantial evidence leads to the belief that the inscription in Brahmi script, along with the paintings in the rock-shelters at Bhatwara Khurd, would have been painted by the stonecutters during their rest-hours. Evidence of similar stone-quarries in the region have also been reported from several localities in Moharpur Pahari, Baghera Khurd and Birohi, where circular stone-blocks are lying in situ and scattered (Tewari *et al.* 1999: 183).

The suggested modes of transport of such huge stone blocks are rolling them down the slopes of the hilly terrain and by raft down the Ganga (Jayaswal 1998: 213-214). In the case of Bhatwara Khurd, the villagers narrate an interesting account. According to them, the villagers collectively used to roll down such blocks, up to the border of their village. This process was repeated from one village to other.

Numerous painted and engraved inscriptions are known from the rock-shelters in distant regions of Madhya Pradesh and Rajasthan. Mention may be made here of some important ones, e.g. Panguraria (IAR 1975-76: 29-30; 1976-77: 32), Bhimbetka, Adamgarh, Tikla (Wakankar and Brooks 1976: 33), Chibbar nala (Kumar 1992: 60-61; Kumar *et al.* 1992: 22) and Deur Kothar (Chakrabarti *et al.* 2002: 68) in Madhya Pradesh and Kanyadeh and Kalaji-ki-kui in Rajasthan. However, here we restrict discussion to the painted examples only. Long back in 1956, V.S. Wakankar had reported an inscription in early Brahmi characters from a rock-shelter of Tikla hills in district Shivpuri (IAR 1956-57: 79; Wakankar and Brooks 1976: 33). This inscription reads '*Dabuken karitam*' which means that the paintings of Tikla hill rock-shelter were executed by '*Dabuka*' or '*Dambuka*'. Another painted inscription of the same antiquity is known from a cave locally called as '*Chudaila Chhaja*' (i.e. ghost shelter), from the same district. This inscription records the depiction of paintings by *bhagavata Kinharakhita, bhadaka Satabhatika* (Prakash 1995: 111). The painted inscriptions in red ochre colour from Kalaji-ki-kui in Rajasthan include the names of seven artists (*rupakaro*) (Kumar 1992: 60-61). It is interesting that like the Bhatwara Khurd inscriptions, an elephant is also depicted with the inscriptions of Kalaji-ki-kui. Painted inscriptions in Ashokan Brahmi script are also reported from Kanyadeh in District Kota of Rajasthan, and Chibbar *nala* rock shelters in District Mandsaur in upper Chambal Valley (Kumar 1992: 60-61; Kumar *et al.* 1992: 22). Recently, painted inscriptions have been noticed at Deur Kothar in District Rewa in Madhya Pradesh (Chakrabarti *et al.* 2002: 68). At least one of them may be placed in 2nd century B.C. Presence of more than a hundred Brahmi script bearing potsherds (placed in period I between c. B.C. 3rd century and 1st century A.D. at a place as far as Kodumanal in Tamilnadu is also notable in this context. These inscriptions are like *Kannan atan, Atan asadan, Pannan Visaki, Kuviran atan*, etc. (Rajan 1997: 29, 30, 80). It is to be noted that the inscriptions mentioned above are not administrative and apparently appear to be painted by the painters themselves, or some by the stone cutters. This evidence clearly shows that by c. 3rd-2nd century B.C. a broader group of people of the remote and far distant areas had acquired the knowledge of writing and reading. The evolution and spread of this knowledge must have taken considerable time before 3rd-2nd centuries B.C.

According to Saraswat "The Brahmi script comes to notice in India when it is fully developed phonologically and from the grammatical point of view. The paucity of pre-Ashokan inscriptions on imperishable material like stone is easily explained as the barks and leaves of trees were mostly used for the purpose, which have all been irretrievably lost. This conjecture gets profound sustenance in the light of the evidence of *bhojapatra* (*Betula utilis*) wood from Sringaverpur in Allahabad District of U.P. (Saraswat 1989). Evidence for the exploitation of *bhojapatra*, which rarely descends below 10,000 feet in the Himalayan forests, comes from Period II (c. B.C. 950-B.C. 700)". Further, Saraswat surmises that the exploitation of *bhojapatra* for construction is unlikely. The main product of this upper Himalayan tree is bark, consisting of thin papery layers peeling off in broad rolls; this bark has been used in ancient India for writing. The evidence is circumstantial, but an important one, indicating, in all likelihood, the use of *bhojapatra* — bark for writing during much earlier times. Perhaps the use of stone for recording inscriptions began in India in Ashokan times. The earlier existence of writing has not offered an *iota* of proof, but the stylistic basis of letters with an advanced phonological value, as encountered in rock inscriptions certainly reflect on a much later and advanced stage of Brahmi script.

In passing, it may be mentioned that the epigraphic evidence from Anuradhapura excavation in Sri Lanka has revealed inscribed potsherds bearing Brahmi inscription in period J, which is dated by radiocarbon determinations between B.C. 450 and 350, if not earlier (Allchin 1995: 62-63, 176-179).

The above description amply demonstrates that the discovery of Bhatwara Khurd site has added very significant source material for the study of art, epigraphy, and ancient to recent stone quarrying activities, ancient trade routes and related aspects.

Acknowledgements

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Graffiti Marks of Kodumanal (India) and Ridiyagama (Sri Lanka) – A Comparative Study

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Abstract

India and Sri Lanka have had close and continuous cultural contacts since prehistoric times. Microlithic tools, graffiti marks, Brahmi script, Prakrit language and Buddhism are some of the shared cultural traits found in early times. In this paper, an attempt is made to show the significance of the identical graffiti marks found in the Early Historical context of two important archaeological sites Kodumanal in Tamil Nadu and Ridiyagama in Sri Lanka. This limited comparative study clearly suggests the close relationship that existed between the graffiti engraved on pots as well as on the stone.

Introduction

Tamil Nadu and Sri Lanka had close cultural contact since prehistoric times due to their geographical proximity. The similarities between the microlithic tools of *Teri* sites in Tamil Nadu and Sri Lanka (Deraniyagala 1992) indicate that the beginning of the cultural contact between the two neighbouring regions goes back as early as the fifth millennium B.C. The topographical and cultural parallelism between Megalithic monuments of both the countries further points to continuous contact (Seneviratne 1984: 237-307). The conquest of Sri Lanka by prince Vijaya and his subsequent marriage with the Pandya princess narrated in *Mahavamsa* explicitly informs us about trans-oceanic voyages. The establishment of Buddhism, the usage of Brahmi script and similarities in coins found in Tamil Nadu and Sri Lanka are indicators of continuous cultural contact between the two regions. These indicators are inter-related and cannot be seen in isolation, to understand the cultural matrix of both the countries. Cultural materials unearthed in the excavations at Anuradhapura (Deraniyagala 1972, 1986, 1990; Coningham 1990, 1991; Coningham and Allchin 1992), Pomparippu (Begley *et al.* 1981), Ibbankatuva (Bandaranayake 1992), Mantai (Carswell and Prickett 1984), Kantarodai (Orton 1993), Mahagama (Parker 1909) and Ridhyagama (Bopearachchi 1996) show the Sri Lankan contact with Tamil Nadu during the Early Historic times. The available epigraphical and archaeological sources suggest that traders played an active role in these cultural activities. The wide-spread occurrence of Brahmi inscriptions in both the regions clearly suggests that literate societies date from at least the 3rd century B.C. These two regions used a common script namely Brahmi, with some special characters to suit each language, but had different languages namely Tamil and Prakrit. The dominance of each of the languages in their respective regions further suggests that at least by the 3rd century B.C. both Tamil and Prakrit were in a well-developed stage. In spite of the geographical proximity and cultural contact, it is quite surprising to observe the absence of Prakrit inscriptions in Tamil Nadu. Recently however, Mahadevan (1995) has reported a number of inscribed potsherds in the Prakrit language written in Brahmi script from Tamilnadu. The seven inscribed potsherds reported, though fragmentary in nature, are located in ancient trade centres like Kodumanal and ports like at Arikamedu and Alagankulam. The recent discovery of an inscribed potsherd written as *abimahatato* found at Kaveripumpattinam, the ancient Sangam Age Chola port at the mouth of the river Kaveri, is quite interesting and unique (Kasinathan 1998; Rajavelu 1999). This is the first sherd so far found in Tamil Nadu written completely in the Prakrit language.

In addition to the common script in the 3rd century B.C., the two regions had common unidentified graffiti marks. Such marks are reported from sites like Karur, Alangankulam, Uraiyur, Kodumanal, Arikamedu and Korkai in Tamil Nadu (Fig. 1) and Anuradhapura, Kandarodai, Manthai, Kelaniya, Ridiyagama and Pomparippu in Sri Lanka (Fig. 2). The present paper attempts to focus on the similarity of the graffiti marks that are found at Kodumanal in Tamil Nadu and Ridiyagama in Sri Lanka.

Kodumanal

The tiny village of Kodumanal (11° 6' 42" N; 77° 30' 51" E) lies in the semi-arid zone and is located on the north bank of the river Noyyal, a tributary to the Kaveri, about

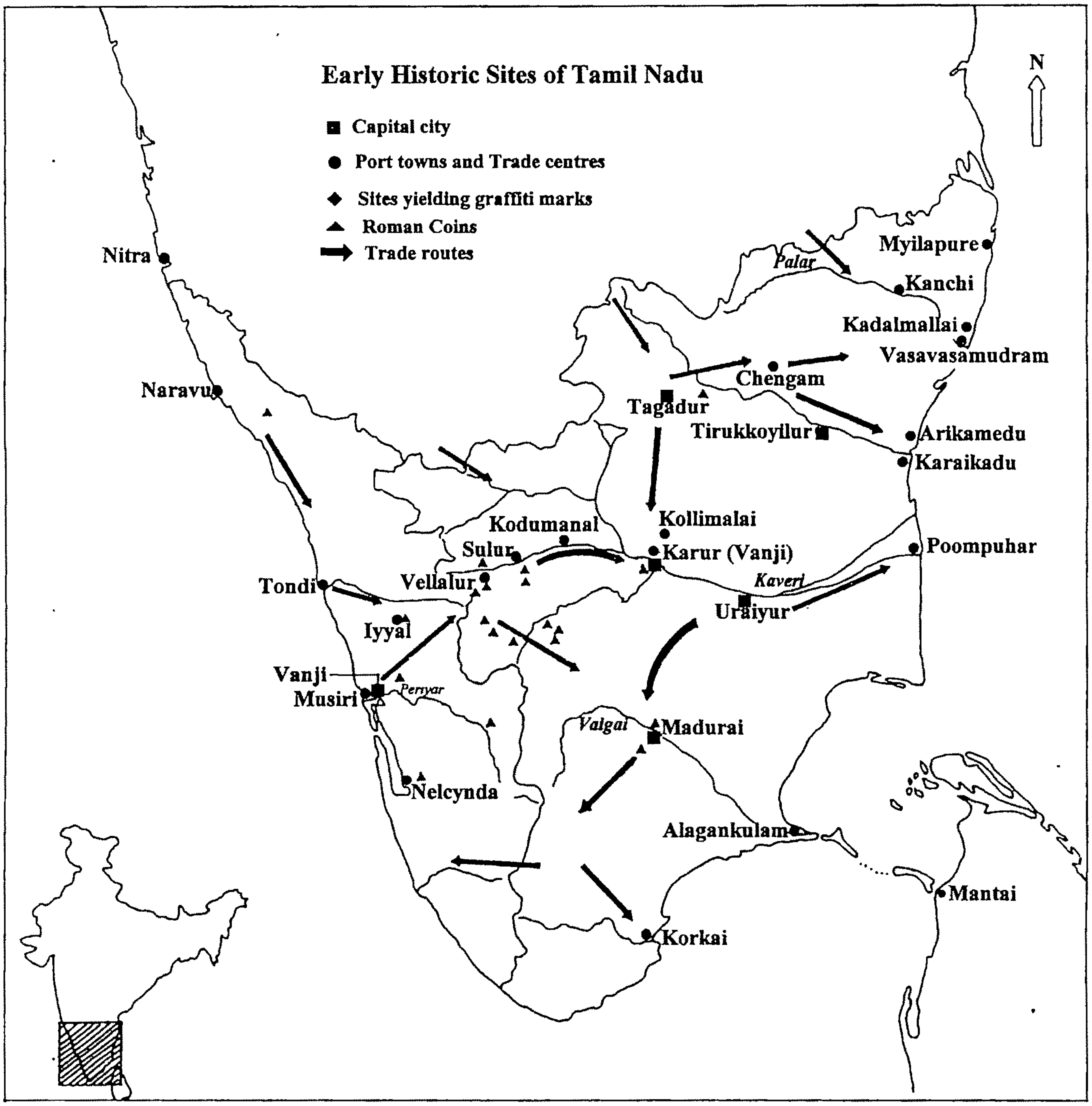


Fig. 1: Map showing the Early Historic sites in Tamil Nadu

20 km west of Chennimalai in Perundurai taluk of Erode District of Tamil Nadu. It is ideally seated on the ancient trade route connecting Karur, the Chera capital of Sangam Age, and the West Coast via the Palghat gap. This site appears to have been referred to as *Kodumanam* in the *Pattirrupattu* text of the Sangam literature. This habitation-cum-burial site was excavated for six seasons (1985-86, 1989-90 and 1997-98). The excavations yielded extensive data on the nature of settlement, gemstone industry, method of iron and steel production, weaving and shell industry, type of burials and their architectural features, the usage of graffiti marks and Brahmi characters, the stratigraphical position of the russet coated painted ware and punch-marked coins (PMC) and the extent of internal and external trade. Briefly, the excavations show that the cemetery belongs to the late phase of the Megalithic period, and were used by people who were living in the nearby habitation site (Rajan 1994; 1997).

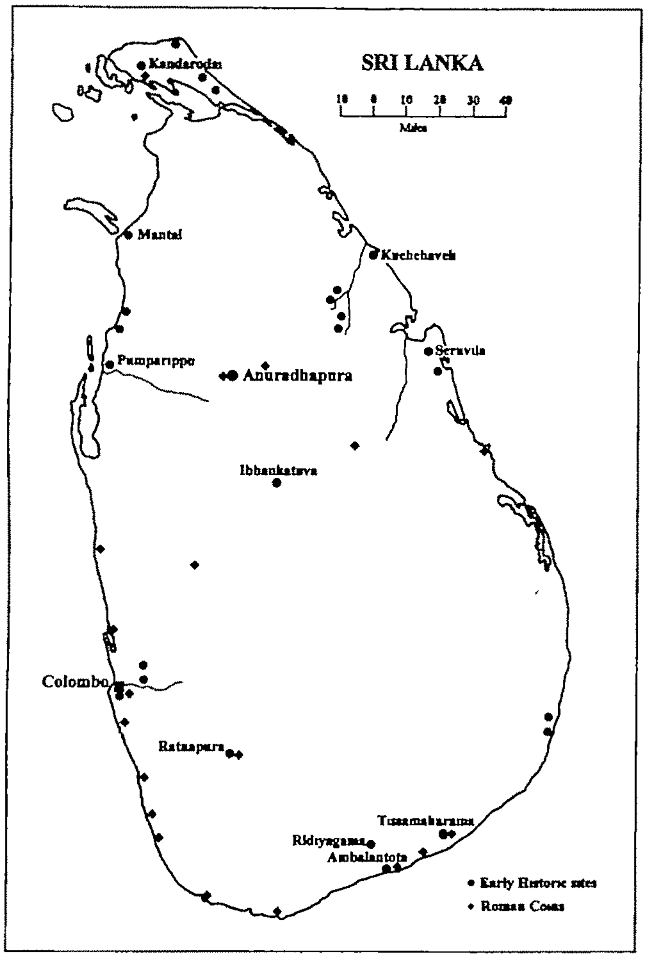


Fig. 2: Map showing the Early Historic sites in Sri Lanka

Ridiyagama

An ancient trade centre, Ridiyagama is situated on the bank of Walawe Ganga 12 km away from the sea coast in the southeastern part of Sri Lanka. The Department of Archaeology and the French Mission of Archaeological Co-operation in Sri Lanka jointly carried out explorations between 1993 and 1996 at Godavaya, on the estuary of the Walawe Ganga and along the river up to Ridiyagama. The results of explorations encouraged the team to undertake a systematic excavation in 1995. The excavation brought to light six stratigraphic layers in a 1.35 m cultural deposit, sub-divided into 45 different contexts determined by significant features. Sherds of Black-and-Red ware were numerous in the third layer. The fourth layer yielded copper slag, mica, burnt charcoal, early Black-and-Red ware, terracotta objects and beads. The other two ancient layers are marked with copper slag and some potsherds. The excavation carried out in 1996 in association with French, Italian and Dutch archaeologists yielded twenty furnaces. Petrographic analysis done on thin-sections of Black-and-Red ware samples by Jean-Louis Reille, shows very clearly the homogeneity of the pottery found in Sri Lanka and Tamil Nadu.

Graffiti

Graffiti, occurring mostly on potsherds, occurs from Harappan times and continued through the Chalcolithic, Megalithic and Early Historic phases. These marks were noted as early as 1881 by Branfill (1881). Since then, scholars like Yazdani (1917), Hunt (1929), Wheeler (1948), Thapar (1957), Seshadri (1971), Sundara (1975), Lal (1962), Gurumurthy (1999) and Rajan (1991) have made a modest attempt to understand these marks in a given chronological context. Unlike North India, graffiti marks in Tamil Nadu are wide-spread and almost uniform in character. Excluding the fragmentary signs there are almost a hundred signs, some of which are compound and consisting of more than one symbol. Some signs have evolved from a basic sign (Fig. 3) and some always occupy the end of the compound sign (Fig. 4) (Rajan 1991).

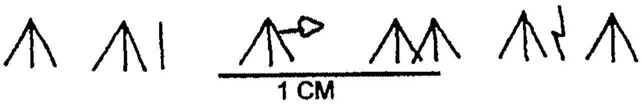


Fig. 3: Kodumanal: graffiti marks

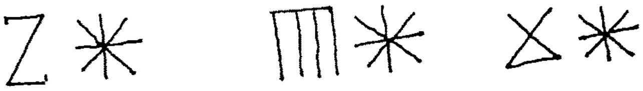


Fig. 4: Kodumanal: graffiti marks

The non-Brahmi symbols of Sri Lanka were studied and the nearest parallel forms were found on the Megalithic and Early Historic pottery of Peninsular India. Deraniyagala (1972) has tabulated some of the graffiti symbols of Sri Lanka. Seneviratne (1984: 1992) made an extensive study of these symbols and identified a few of them as clan or family symbols.

It is quite interesting to observe the contextual position of graffiti in Tamil Nadu. Marks are found in different media such as metal, stone and pottery. They are observed in pre-Tamil-Brahmi and in Brahmi context. Lal (1962) traced these graffiti to Harappan times passing through Central Chalcolithic period. As far as Tamil Nadu is concerned, they are found uniformly throughout the region. They are all post-firing and mostly written on the shoulder of the pot. They are written from left to right as suggested by overlapping scripts and their position at the end of sentences written in the Tamil-Brahmi script (Fig. 5). It is to be emphasized here that Tamil-Brahmi scripts found in the subsequent period are also engraved on the shoulder portion of the pots. This indicates the importance given to

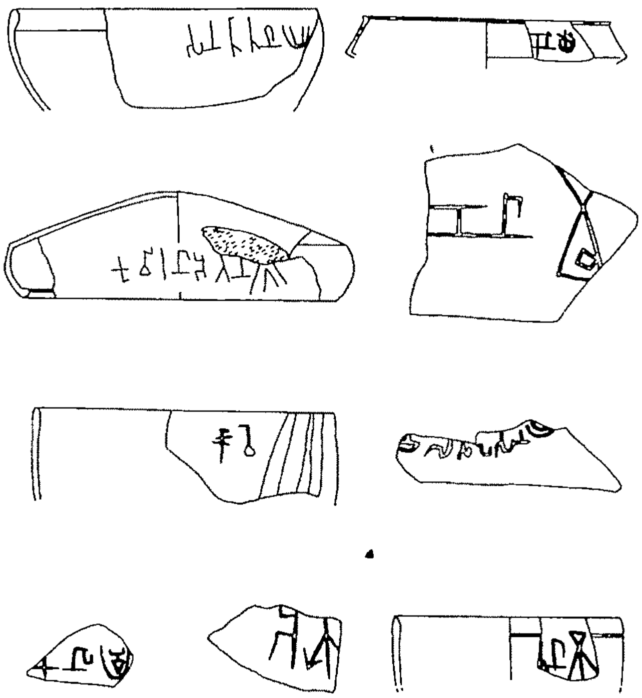


Fig. 5: Kodumanal: Tamil-Brahmi inscribed potsherds ending with graffito

the graffiti in society. In the second stage they are found in association with Tamil-Brahmi script but mostly at the end of the word. This phenomenon is observed in all media. At Karur, they are found at the end of the personal name engraved on a ring, bangle and potsherd (Seetharaman 1994: 86-87). The position, direction of writing and method of writing in Sri Lanka are identical to the Peninsular India.

At Vallam near Thanjavur, three stages of the graffiti marks and Brahmi script have been observed. In the early stage graffiti marks are found alone. In the middle stage they are found in association with Tamil-Brahmi scripts. In the late stage the Tamil-Brahmi scripts are found alone. The occurrence of the graffiti marks declines drastically once Tamil-Brahmi scripts started appearing (Subbarayalu 1985). Whether the Tamil-Brahmi script was developed from the graffiti marks is yet to be assessed. However, the position of the marks and their association clearly suggest that there is a connection between these marks and the script. However, at the present level of our knowledge these marks should be taken as an undeciphered script. It is quite interesting to observe that at Anaikottai in the Jaffna peninsula of Sri Lanka a seal was discovered with two lines of engravings (Fig. 6) (Raghupathy 1987). The bottom line has three signs in Tamil-Brahmi and the three graffiti marks on the top. These marks are considered equivalent to the Tamil-script found below. The scholars identify them as bi-lingual or bi-script of one language.

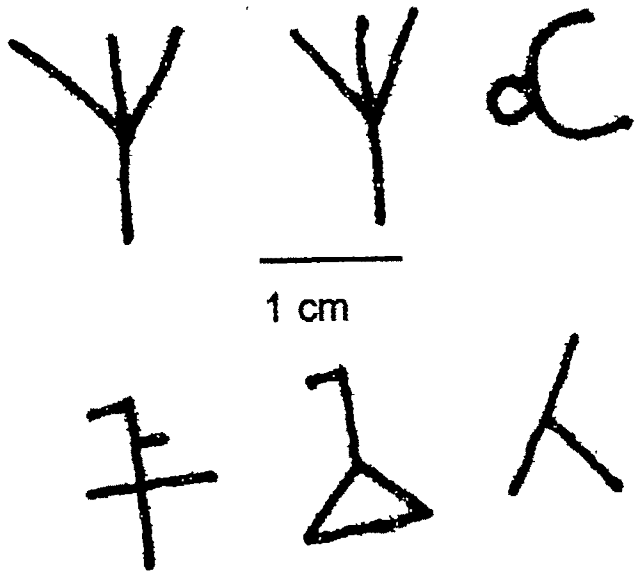


Fig. 6: Anaikottai: Seal engraved with graffiti marks in the top line and Brahmi script in the bottom line

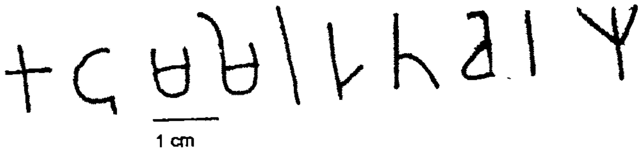


Fig. 7: Edakkal: Tamil-Brahmi inscription having a graffito at the end

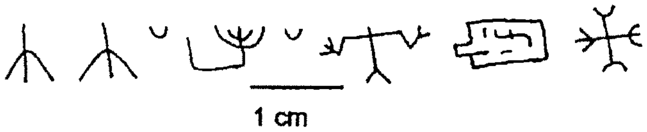


Fig. 8: Karur: graffiti marks engraved on a copper ring

Similar mark is also noticed recently at Edakkal in the Tamil-Brahmi context (Fig. 7) (Mahadevan 1998). This mark is significance here as it is found after the name Chera, one of the three ancient kingdoms of Tamil Nadu. An identical mark is also found at Kodumanal, Vallam, Karur and Sanur. At Karur quite a number of graffiti marks are on rings, bangles, pottery and coins. A group of graffiti marks are found engraved on a copper ring (Fig. 8) (Seetharaman 1994). A symbol found on a potsherd at Kodumanal is repeated on a punch-marked coins and in Tamil-Brahmi rock inscriptions at Kongarpuliyamkulam and Alagarmalai (Fig. 9) (Rajan 1994). A few marks are found in contextual positions. Some are always found at the end of a group of symbols. Interestingly a particular sign is found in different media and in different geographical regions and in different chronological frameworks.

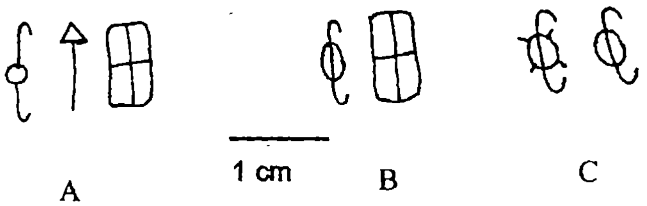


Fig. 9: Graffiti marks from Kodumanal (a), Kogarpulıyankulam (b) and Alagarmalai (c)

Rajan (1991) suggested that these graffiti marks are not potter's mark or tribal marks but had some greater significance. The Kodumanal evidence suggests that symbols found in burials are clan marks but the graffiti found in the habitation, indicate some other meaning in addition to clan marks. Hence, these graffiti marks cannot be considered mere marks. If one considers them as an undeciphered script, its uniformity of occurrence over a wide-spread area suggests the closeness that existed between the communities. This link to some extent suggests political integration as well.

It is now accepted that date of the Tamil-Brahmi goes back to the 3rd century B.C. The Kilvalai rock paintings depict five symbols drawn in uniform size and placed close to one another, giving appearance of a written record (Samy 1984: 71-72). Signs like fish and bow (the *insignia* of Pandya and Chola respectively) suggest that they originated first as a sign of the society and later became *insignia*.

The excavations at Kodumanal and at Ridiyagama yielded a large number of potsherds bearing graffiti. Excluding the fragmentary graffiti, there are about fifty complete or almost complete signs found at Kodumanal. These post-firing graffiti are found on the neck portion of the vessels, but in the case of ring stands and dishes they are found on the exterior surface of the base and sometimes on the inner side also. Most of them are engraved on the shoulder portions of the Black-and-Red ware pottery. The graffiti, which are clearly identifiable as Brahmi letters are not dealt with here. Here, the non-Brahmi signs only are discussed.

The Brahmi *ma* like symbol (Fig. 10 and 11) occurs individually or in composite form both at Kodumanal and Ridiyagama. This basic symbol had some additional strokes applied at the top or bottom. A group of three symbols is found on a painted potsherd of period I at Kodumanal. Similar symbols in groups of three or four are common on punch-marked coins. This *ma* like symbol is more common in the Gadige area of Anuradhapura, Sri Lanka (Fig. 12) and at Korkai, Tamil Nadu (Fig. 13). It is pertinent to record that Korkai is the nearest Pandya port to Sri Lanka.

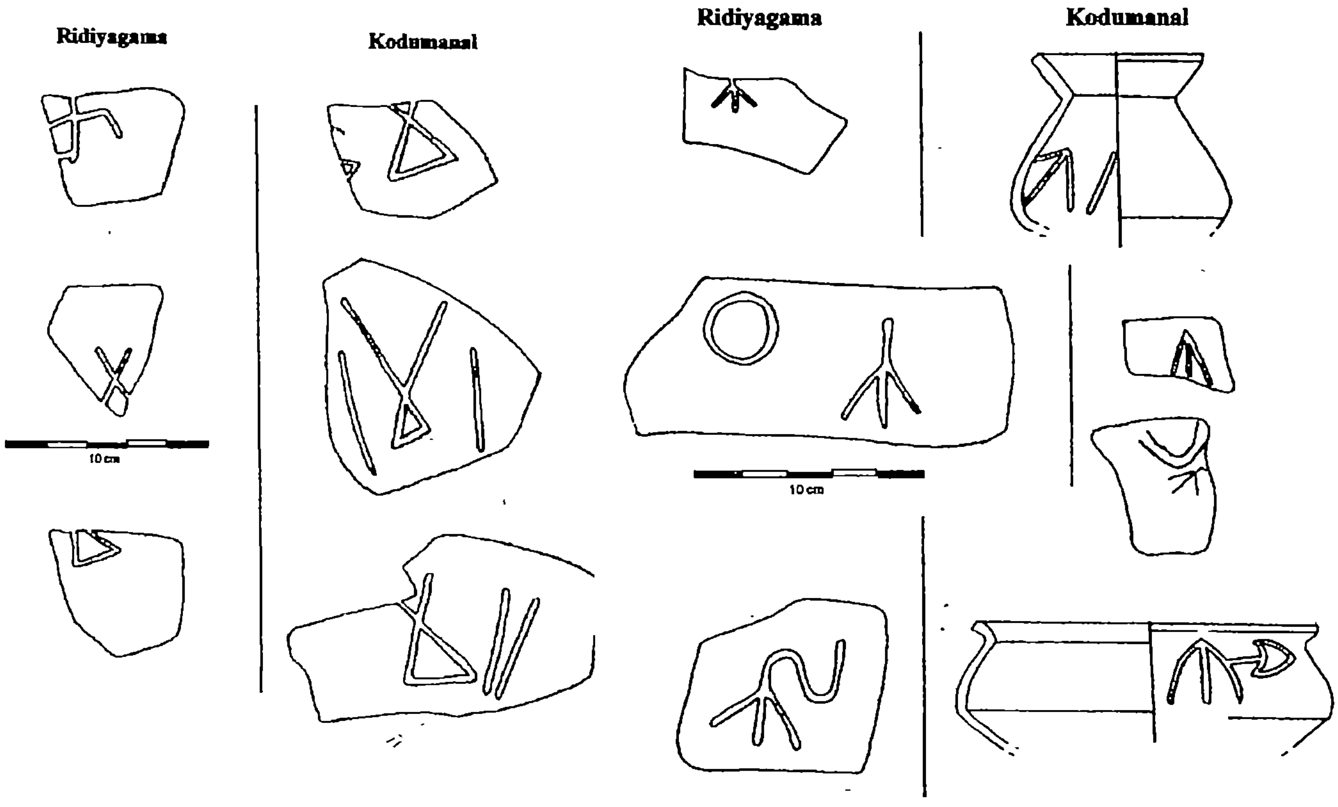
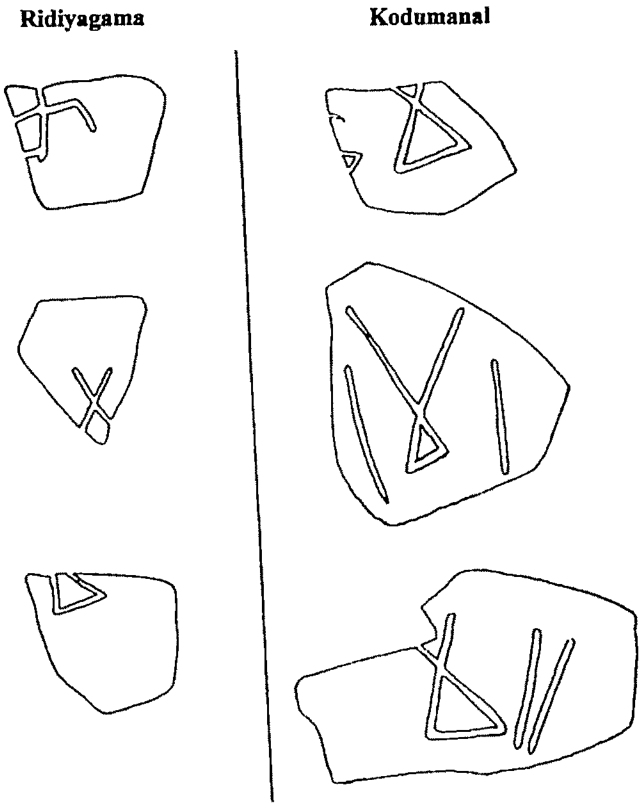


Fig. 10: Brahmi *ma* like graffiti marks from Kodumanal and Ridiyagama


Ridiyagama

Kodumanal

Fig. 11: Brahmi *ma* like graffiti marks from Kodumanal and Ridiyagama

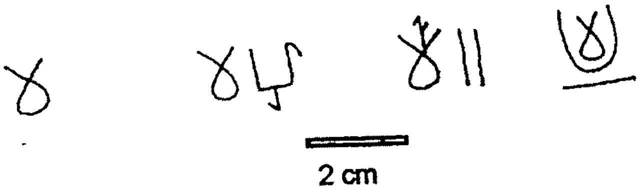


Fig. 12: Anuradhapura: Brahmi *ma* like graffiti marks

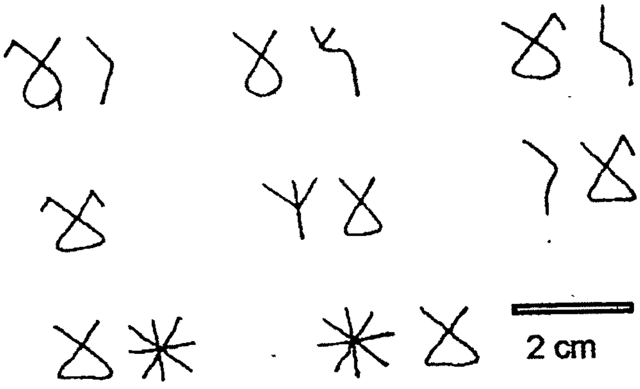
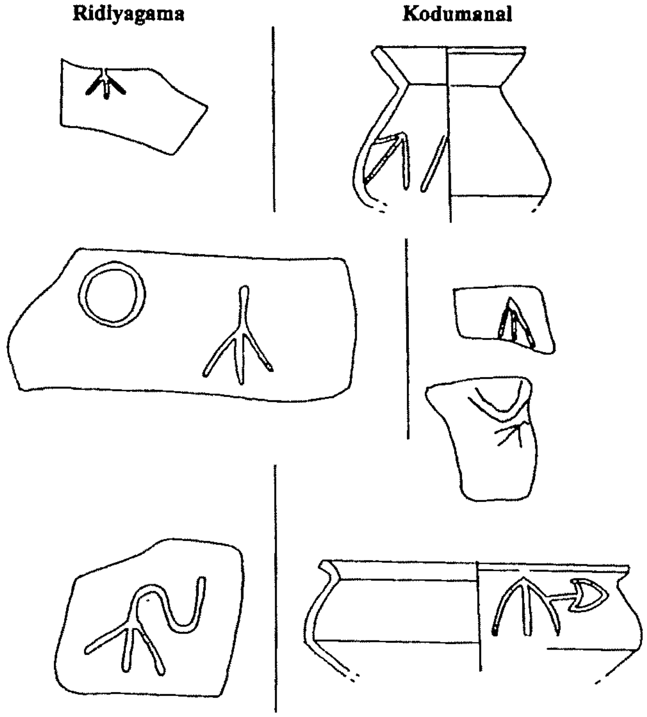
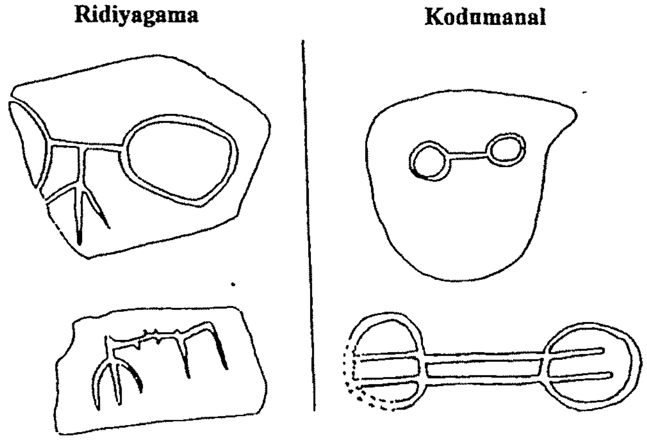


Fig. 13: Korkai: Brahmi *ma* like graffiti marks


Ridiyagama

Kodumanal

Fig. 14: Graffiti marks from Kodumanal and Ridiyagama


Ridiyagama

Kodumanal

Fig. 15: Graffiti marks from Kodumanal and Ridiyagama

One vertical line at the centre and two oblique lines on its side meet at a point on the top serve as a basic symbol (Fig. 14). This symbol is further elaborated with adding some additional strokes probably indicating different but related meaning to the basic symbol. This symbol too occurs individually or in composite form. For instance, one circular symbol found before this symbol. Two circular symbols connected by a horizontal stroke rested on this basic symbol (Fig. 15) at Ridiyagama. At Kodumanal it is found without the basic symbol.

The individual ladder like symbol (Fig. 16) is found in different forms at Ridiyagama and at Kodumanal. It is

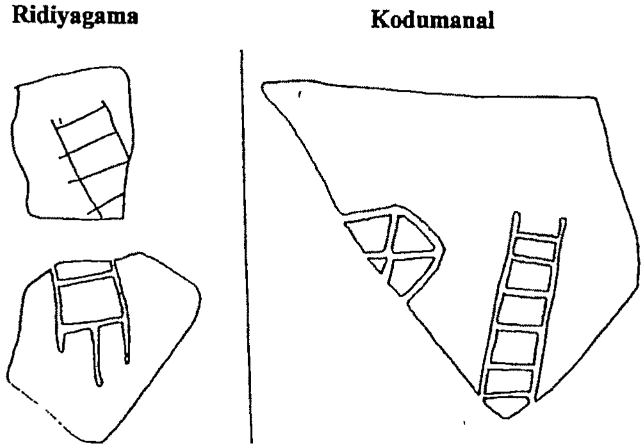


Fig. 16: Graffiti marks from Kodumanal and Ridiyagama

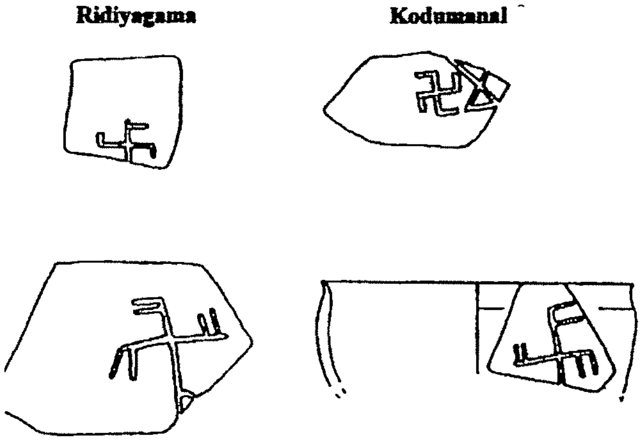


Fig. 17: Graffiti marks from Kodumanal and Ridiyagama

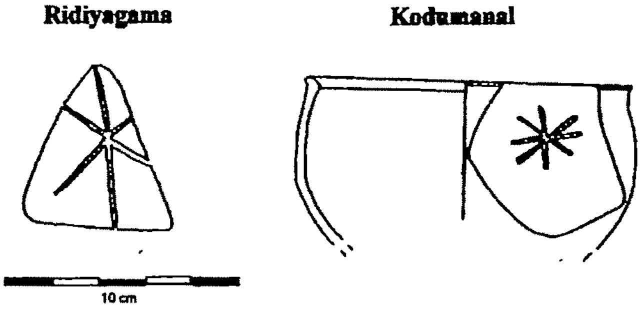


Fig. 18: Graffiti marks from Kodumanal and Ridiyagama

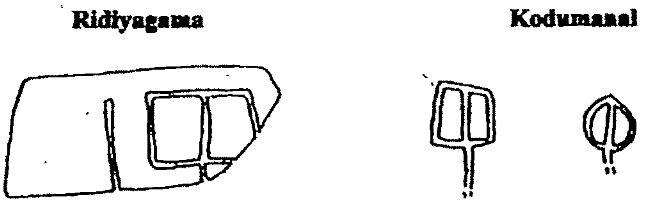


Fig. 19: Graffiti marks from Kodumanal and Ridiyagama

found individually as well as in composite form. The ladder symbol is reported at Kelaniya also. The symbol *swastika* (Fig. 17) is found both individually and in composite form. In both the sites the arms of the *swastika* symbol are branched out.

The star-like symbol (Fig. 18) usually occurs at the end of a compound sign. Likewise other symbols like the bifurcated square box (Fig. 19), two oblique lines meeting on the top (Fig. 20) and the tree symbol (Fig. 21) are common in both the sites.

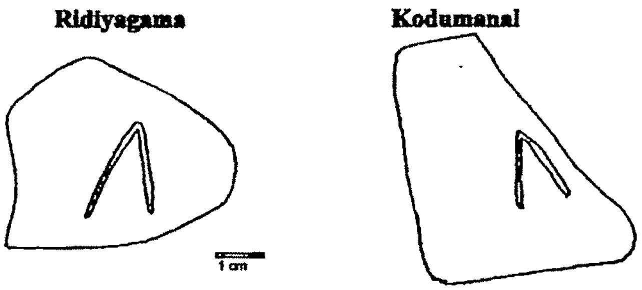


Fig. 20: Graffiti marks from Kodumanal and Ridiyagama

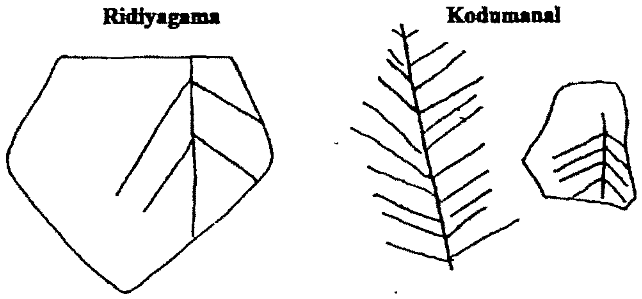


Fig. 21: Graffiti marks from Kodumanal and Ridiyagama

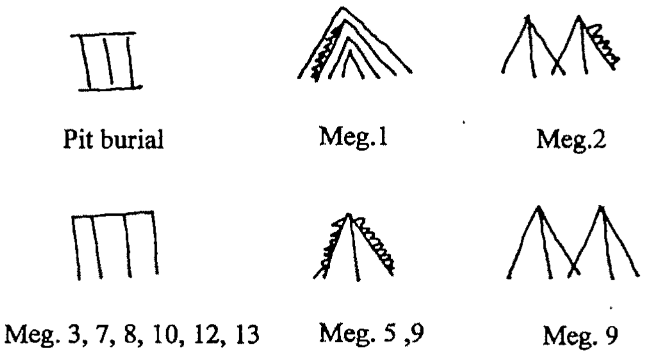


Fig. 22: Kodumanal: graffito marks collected from a burial

Conclusion

The prevailing concepts as to the nature of the pottery graffiti may be classified as follows:

1. Potter's marks
2. Owner's marks
3. Clan marks

The site Kodumanal alone yielded more than fifty symbols and they occur repeatedly in different contexts in spatially well-distributed sites. If we consider them as a potter's marks then one has to conceive that there are a large number of potters' families working at the site and they supplied pottery to the sites beyond their reach. This is rather doubtful. Moreover all the marks are post-firing ones while if they were potter's marks they would have easily marked them when the pot was in leather condition.

One symbol or one set of symbols must belong to an owner only, if the graffiti are owner's marks. However, it is found that a symbol or a set of symbols is repeated within a site as well as at different sites in the same period. So the concept of owner's mark is also unlikely. Treating them as clan marks or the marks with other meanings would be the plausible one. In support of this, each burial at Kodumanal had a distinct symbol on most of the pots placed as grave goods (Fig. 22). Of the fifteen burials excavated, only three (Meg. 4, 6 and 11) did not yield any graffiti on their pottery. Even the pit burial found in the lowest level of the habitation trench had a graffiti mark.

The fact that each megalithic burial was associated with a special symbol engraved on all its pottery suggests that the particular symbol is somewhat important and is closely related to the person in whose memory that Megalith is erected. Certain symbols like four vertical lines hanging from a horizontal line collected from different cemetery areas of Kodumanal denotes a clan or a social group. However, more than fifty graffiti marks found in the habitation make one rethink this interpretation as one can not expect more than fifty clan groups in an Early Historic site. As noted above, all the excavated burials at Kodumanal, have only six symbols. These six symbols were also found in the habitation. It provides a crucial piece of evidence to link the habitation with the burial site.

This paper made a small attempt to expose the significance of these graffiti marks. To understand the true meaning that stands behind these signs and the proper linkage between the scripts and the graffiti marks requires extensive exploration and excavation. Therefore, the identification of symbols lies in the future documentation of the graffiti marks that are found in different geographical zones.

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Megalithic Culture of the Madias of Maharashtra

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Abstract

This paper deals with the Megalithic burial practices of the Madias of Maharashtra. The presence of Megalithic practices in different regions suggests to some degree the use of stone for the dead is a world-wide feature. Megaliths of similar character suggest inter-regional contact and cultural sharing. Megalithic monuments used as a memorial are found in various parts of the world including South India, Central India and Northeast India. Different types of Megaliths have been found from Naikund, Borgaon, Chingelput and Maski and Brahamagiri in the Vidarbha Megalithic region around Amaravati and Nagpur where Madias live today.

Introduction

Madia is considered a sub-tribe of Gonds of Central India. Physically the Madias are very thin to medium in body size and short to medium in stature. They bury their dead. Erected stones are very commonly seen around most of the settlements of the Madias. Various kinds of Megalithic structures are present and different ceremonies are associated with them. They keep items such as beds, baskets, earthen pots and even tobacco and *Mahua* near the burial place. Megalithic ancestors of these people may have practised similar customs and rituals.

The Madias occupy the hills and plains of Chandrapur and Gadchiroli District of Maharashtra. They belong to the larger ethnic group, known as Gonds who are distributed over Madhya Pradesh and Maharashtra. The area is most the isolated portion of the district and was traditionally avoided by neighbouring populations. The actual term is Madia also spelled "Maria". In Hindi 'r' is alternatively used for 'd'. In Marathi *'Mad'* means one variety of a palm type tree, *Madia* means forest dwellers or closely linked with the tree *Mad*. A study of the names, clan names and rituals indicates that Madias and Gonds are from the same tribe. The Tribal Research Institute of the Government of Maharashtra refers to the Madia as the Madia Gond. Madia language has a strong influence of Telugu and Marathi and it has no script. The language has been preserved by oral transmission from generation to generation (Reyivolu Kezo 1998).

Madias build their houses in remote open areas in the forest. The burial ground is just outside the village and fenced with bamboo biers. On the extreme boundary of the village a number of long stone cairns are found with wooden animal figures (Fig. 1) or rags tied around them (personal data collected with Kezo).

The Madias are divided into many exogamous clan groups. The clans are grouped into endogamous phratries: *Saat Dev* (Seven Gods), *Saha Dev* (Six Gods), *Panch Dev* (Five Gods) and *Char Dev* (Four Gods). Each phratry usually has names that identify group members. These groups' identifying objects are known as totems. Each clan has its peculiar totems (Table 1).

Table 1: Madia totems

Phratry	Madia totem name	Animal
Saat Dev	*Upandi*	Porcupine
Saha Dev	*Duwal*	Tiger
Panch Dev	*Kodor*	Bird
Char Dev	*Amil*	Tortoise

Each clan worships a particular god or goddess. Members of same clan cannot intermarry.

Life After Death

The Madias strongly believe in the continuity of life after death and they remain faithful towards their ancestors. They believe that after the death of a person, the soul remains in the air of the village where the person lived. They do not have the concept of *'Pancha-Bhuta'* constituents of human body, but it is thought that the human body

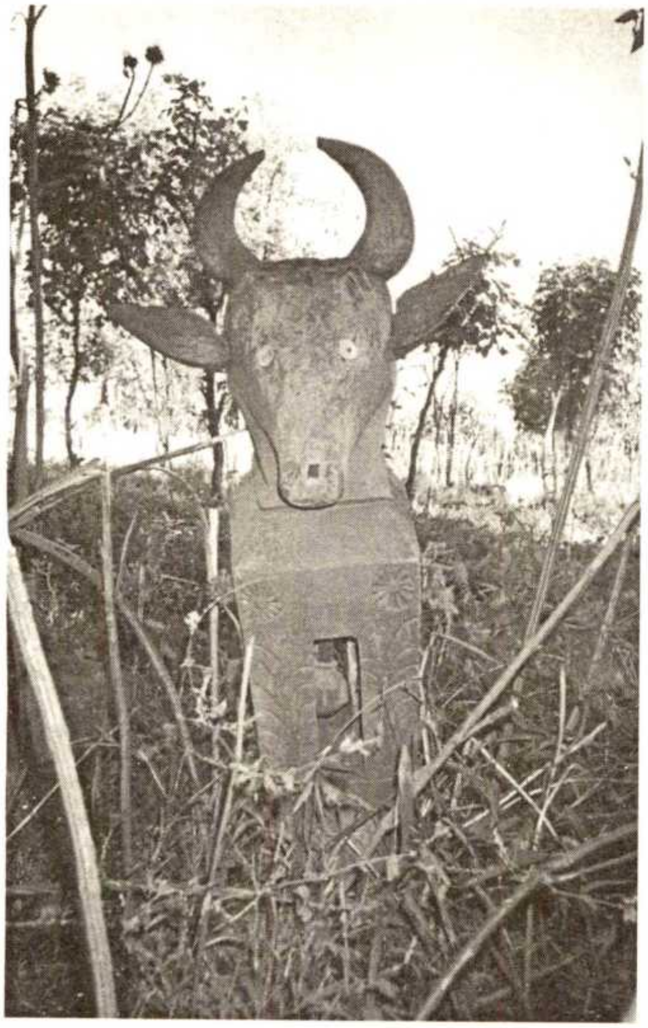

Fig. 1: Wooden animal figure placed in the graveyard

comes from the soil and goes to the topsoil after death; hence they practice burial of the dead. They also believe that all persons are reborn. The belief in rebirth is so strong that they give the name of the dead ancestors to their offspring. It is important to mention according to Madias here that good deeds in the former life lead to rebirth as a human being while evil works lead to birth as an animal in the next life.

There is belief among the Madias that dead people *live* in their graveyards. So generally they keep certain articles used by the dead in the graveyards. They carry one piece of wood or brick taken out from the roof of the house during the process of burial and put it over the grave, so the dead person feels that he is living in his own house. The Madia people always erect some large and tall memorial stones inside the village to commemorate the dead ones (Fig. 2). It is a common memorial place. They wrap these stones with new clothes once or twice in a year (Fig. 3), and during every festival they keep good food, cooked for family members, near these memorial stones so that their dead ones also can enjoy these festivals.

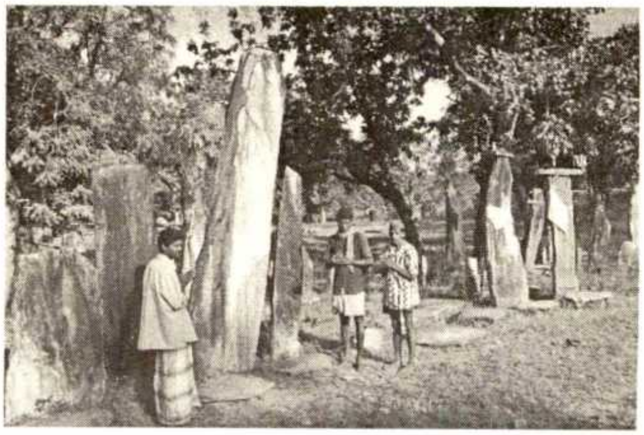

Fig. 2: Tall memorial stones being worshipped

The dead body of a Madia person is not specially treated. It is disposed as it is. Neither it is washed nor it is

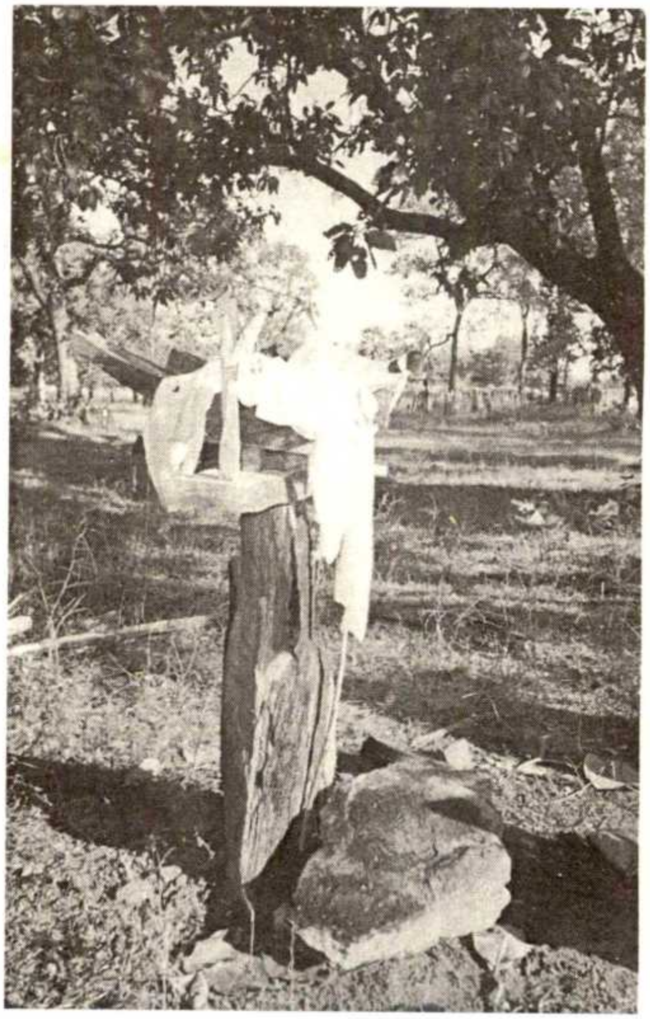

Fig. 3: Memorial stone being wrapped with a new cloth

dressed with new clothes. All the clothes and articles present on or near the bed are disposed along with the dead body. The valuable things like gold etc. are taken from the body and kept with the family members. The *'mahua'* treatment of the dead body is very important. They believe that it helps in salvation of the dead. All the family members and relatives pour one spoon full of *mahua* on the mouth of the dead body before carrying it for disposal. Also, the dead body is covered with a white cloth. It is a new one and most frequently it is brought from the market by one of the kin members. This cloth is buried along with the dead body.

Arrangement for disposal

The village people dig the pit for burial. Before carrying the dead body three or four people go to the nearby jungle outside the village and dig a pit in a selected place in advance. The dead body is generally carried along with the bed on which the person died. Four people hold the four legs of the bed. Sometimes they tie two long bamboos with the bed lengthways so that it can be conveniently carried.

Sometimes they also use a carrier made out of wood or bamboo. For this, two long wood pieces or bamboos are taken and small equal bamboo sticks are tied to it breadthwise. The dead body is placed in the middle and four people carry it holding the body. Any person can take responsibility to carry the dead. The persons carrying the body may be changed on the way. Generally the relatives or neighbours carry the dead body but any four members of the village can carry the dead body.

All the villagers are supposed to accompany a funeral procession. However, the mass companions are the adult male members. The normal burial place is in the nearby forests or on uncultivable lands outside the village. The burial place is known as *'Banda'* or *'Gumia'*. Great persons such as chiefs are buried within the boundary of the village or near the road in front of the entrance to the village. Sometimes the dead are buried in their agricultural fields or vegetable gardens. Small children are always buried outside the village. Pregnant women are buried on the opposite bank of a nearby river, as it is believed that the unborn child present in the mother's womb may become a ghost or an evil spirit.

Method of Disposal

The dead body is taken to the forest near the prepared pit. The people taking part in the funeral procession stand around it. The trench is first neatly prepared. There is no particular direction for placing the dead body in the pit. The white cloth by which the dead body was formerly covered is first placed at the base of the pit. Then the dead body is kept over the cloth and a flat wooden piece is placed over the body. The whole pit is filled up by soil in such a manner that it looks like a dome. Over it some stones are placed and the articles used by the dead person are put on, after breaking them.

On completion of the burial process the Bhagat (priest) starts his rite for the future well-being of the soul. He first sows one hand full of rice over the grave and makes three rounds around the grave, without following any direction. This act is performed to guard against the possible coming back of the soul with the villagers while returning from the funeral ceremony.

There are several norms and taboos connected with the disposal. These are:

1. all the dead bodies are generally buried outside the village,
2. great men, rich people, village chiefs, landlords, etc. can be buried within the village,
3. burying small dead children outside the village is a must,
4. pregnant women are always buried on the bank of a nearby river,
5. the dead bodies are always disposed during the daytime,
6. the people taking part in a funeral ceremony wash their hands and feet in a near by river/spring before entering into the village,
7. articles used by the dead person are kept on the graveyards,
8. for salvation, all the villagers and relatives pour one spoonful of *mahua* each on the dead person's mouth.

After the funeral ceremony family members worship their god for the future well-being of the dead person. On the thirteenth day they perform *'Polwa'* ceremony, but incase of economic difficulties they can perform it any time within one year after the death of an individual. On the day of *Polwa* a memorial stone is erected in the name of the dead person. Early in the morning all the male members of the village go to the nearby river to bring the memorial stone. The memorial stone is a huge stone slab made out of sedimentary rock (rarely metamorphic rock), generally 1.5-3.5 m in height and 0.75-1.0 m in breadth. The villagers keep the selected stone prepared in advance, cutting it into a definite shape and size. The stone is then brought to a common place where all the memorial stones are erected in the village. At this place the presence of village chief i.e. *'Bhumia'* is compulsory.

At first the memorial stone is erected on the ground under the guidance of the *Bhumia*. Then a small stone having a flat floor like surface is placed on the ground touching the body of the large erected stone. The stone is placed in such a manner that it lies in front of the erected stone and its flat surface lies facing upward and so it can be used as a floor for performing *Puja* or other activities like sacrificing an animal or keeping food for the deceased. A flat wooden sheet is fixed on the top of the erected stone by making a hole on it. Some wooden weapons like bow, arrow, swords, knife or even a gun, are also kept over the wooden sheet. The wooden peacock is the most frequently placed object on the sheet. Sometimes an idol is also placed over it. This might be related to beliefs in life after death. The middle portion of the erected stone is tied with a white piece of cloth and a twig of a sacred tree known as *'Lekimara'* is placed in front of the stone.

The *Bhumia* washes the stone with water and puts some turmeric and vermilion powder on it. Then a cock or a goat is sacrificed. Sometimes a bull or a buffalo is also sacrificed but a pig is never sacrificed. It is observed that if a man dies they sacrifice a bull. In case of a woman a cow is sacrificed. Apart from it, the blood is poured over the stone. The *Bhumia* starts worshipping. The sacrificed animal is taken to the house, cooked and a plate containing its meat is placed in front of the stone.

Pollution

The Madias believe in *pollution* of a household in which the death has occurred. It is a belief that the persons who take part in a funeral procession are also polluted. The duration of pollution due to death is very short. Just after the dead body is removed the whole household is cleaned and all objects are washed. There is restriction in cooking in that household on the day of the death. There is no restriction regarding dress, ornaments, shaving, haircutting or sex life.

The polluted house is cleaned by washing. All the articles used by the deceased are taken along with the dead body or destroyed. The valuables are washed and kept with the family. The floors are plastered. All this work is done just after taking the dead body for burial.

Megaliths

The term Megalithic is derived from the Greek words *lithos* meaning stone and *mega* meaning large. An intriguing feature of some Megalithic tombs is the presence of designs carved into the surface of the stones. These designs are known as "Megalithic art". Wheeler (1948) described megaliths as "those monuments, which are built of rough, large and undressed blocks of stones". Those monuments are connected with burials, which fulfil funerary or religious functions. These megaliths in the earliest stages were used in the funeral proceedings but later on these were erected as memorial stones. The common types of megaliths found in India are: (1) Cairn circles, (2) Cists, (3) Menhirs and (4) Dolmens.

Cairn circle type of megaliths consist of round stones. Menhirs are tall memorial stones erected to give some clue to the presence of a grave at that place. These stone pillars vary in length. In the Dolmen graves the body is placed on a slab of stone on a raised platform covered from all sides with a flat stone slab resting on the four corners of the dead body (Nadeem Hasnain 1988). Vidarbha Megalithic Culture spread over the same area of Nagpur and Amaravati where Madias inhabit today.

Certain types of Megaliths are more common in some regions, whereas certain regions show more than one type. For instance, the region of Vidarbha has only one type i.e. the stone circle with cairn filling. Even in Vidarbha, except the site of Pimpalgaon in Bhandara district (which was reported to have housed a dolmen and non-existent now) these stone circles have been found located in regions where the rock bench is high or where the hills are nearby. No cists are available, obviously because the Deccan trap, which is local rock formation does not yield slabs. By and large, however, it may be observed that chamber tombs and cists are more common in Andhra and Karnataka where quartzite sandstone abounds, rock-cut chambers and topikals in Kerala and menhirs in Andhra and Kerala (Deo 1985).

The erection of a Megalithic structure to commemorate the dead ones is most essential even for the Madias. This is a rare practice in India and they must have inherited this from their prehistoric forefathers. The erection place is a common one for all the villagers. This place is separated from the houses and often lies near the main village road. The order of arranging these monuments is according to age and social status. Persons having high social status occupy places in the front, their monuments are large in size and beautifully decorated while the monuments of people who died at an old age are erected in the second row. The monuments of children and adolescent dead are erected in the last row, and they are generally small in size and without any decoration.

The Madias have a peculiar way of burial of a dead body. They believe in life after death and they also portray it in the burials. At the site of burial or maybe in a graveyard they put up a huge stone. A vertical stone is erected for men while horizontal ones are made for women. Also the status of the dead person is considered. The more popular and important person's burial carries a stone much higher than the others. Thus height of the erected stone suggests the dead person's position in the society. Here we see that along with the dead body his pet animal, or his belongings, which he adored, must be buried along with the body. They keep all the essential items such as *Khatiya* (bed), basket, and earthen pots near the tomb. They also keep the dead person's favourite things such as tobacco, wine, sweets, etc. The dead person is considered to have his share even after his death (author's field observations).

The family members of every deceased person keep food near these monuments during festivals and ceremonies. Whatever food is cooked for the family members, it is kept there. They also wrap these stones once or twice in a year with new white cloths. The megaliths of village chiefs are erected near their graveyards. These megaliths are large in size (about 3.5-4.0 m in height and 0.75-1.0 m in breadth). They also bear beautiful decoration on the wooden piece fixed on top of the stone. It bears even different totems. Blue and red colours are mostly selected for decorating these megaliths.

Death is a biological process. There are different beliefs about the death in different societies. Burial practices vary from society to society. Sometimes burials are found along with certain things like animals and eatables etc. In Maharashtra some tribes offer cooked rice and water to the dead person and keep it near the burial place which shows the belief in life after death.

The Mahadeo Kolis bury dead bodies in a sitting position (Ghurye 1963). In the Megalithic tradition the occurrence of pottery, ornaments and weapons with burials are quite common. Vidarbha Megalithic burials are sometimes associated with horse skeletons and gold ornaments, which suggests their high social status (Deo 1985).

Among the Khasi Hills it can only be indicated that the Megalithic culture flourished upto the 13th century A.D., whereas Manipur Megalithic culture continues to be practiced even today by various Naga tribes inhabiting different parts of the state. Most authorities agree that the Megalithic culture is a prehistoric tradition and in this landlocked isolated corner of India has a living tradition (Binodini Devi 1998). The same tradition is practiced by the Madias of Maharashtra.

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A Note on the Cultural Importance of Ethnographic Objects

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Introduction

Museums play a vital role for conserving cultural heritage through collection, preservation and exhibition of cultural objects. Again, study of cultural heritage of the tribal communities is essential as the tribal culture is fast changing and thereby losing its traditional way of life. To preserve the fast changing traits of material culture of tribal population and to carry on research on the techno-cultural aspect, anthropological museums have been set up in many Tribal Research Institutes. Mention may be made of museums of tribal research institutes of Bihar (1954), Orissa (1955), Chindwara (1954) and Hyderabad (1963), (Behura 1991).

India is the land of diversity. In India itself, there are not only people speaking different languages, but also there are different cultural groups ranging from primitive hunters and pastoralists to industrial city dwellers. An ethnographic museum, is the proper place where these diverse lifestyles-primitive, tribal, folk and urban, can find a place. To the museum visitors such exposition not only enhances their knowledge, but it helps to develop a sense of respect and tolerance keeping the people away from an ethnocentric attitude (Choudhury 1976).

Through ethnographic collections, a community may be perceived in its totality. These ethnographic collections may not give the racial account of the community, but they throw light on the aesthetics, economic and religious pursuits, knowledge system, degree of adaptability with the ecosystem etc. They reveal the historical and also the contemporary way of life. In this note an attempt has been made to perceive how ethnographic objects have a significant bearing on the cultural heritage of some ethnic groups.

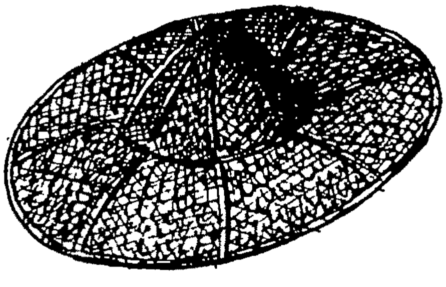

Fig. 1: *Khumri* (Rain hat)

Khumri (Rain hat, Fig. 1)

This is made of bamboo splits and Mahula (*Bauhinia rahlii*) leaves and is used by the Baiga tribe and other neighbouring communities of Mandla, Dindhori district of Madhya Pradesh.

It is used as umbrella for preventing rain especially when in the field for cultivation or for grazing animals. The rain hat is also used for religious purposes. A small sample of Khumri, a thread twisted with the hair of cow's tail, are offered to the deities — *Lachchi goala*, and *Lachhi goalin* for appeasing them during worship.

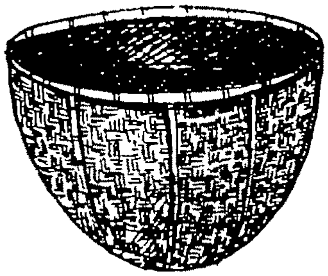

Fig. 2: *Bijbauni* (Bamboo bas)

Bijbauni (Bamboo basket, Fig. 2)

This specimen is a basket made of bamboo split and plastered with mud and cow dung. It is used by the Kamar tribe of Raipur district, Chhattisgarh as a sacred container for offering the sowing seeds to the deity. During the *Akti Teohar* festival, in the month of *Baisakh* (April-May) all the families bring a basket full of paddy seed to the shrine of the village deity, *Thakur Deo*. The priest takes out a handful of seeds from the basket and offers it to the deity during worship. After worship the villagers take their respective baskets full of seeds which are then sowed in the ploughed field.

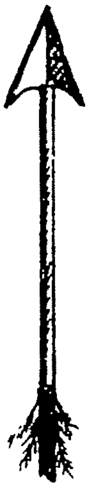

Fig. 3: *Bisar* (Arrow)

Bisar (Arrow, Fig. 3)

A specimen made of iron blade and bamboo stick, decorated with the feathers at its back end, is common to almost all the tribal societies. In the past, the tribal people used it as hunting implement. Due to introduction of the new forest act, the tribals are bound to abandon the hunting. Now this arrow is used for defensive purposes.

The Baiga people of Madhya Pradesh never make the arrowhead (made of iron blade) in the month of *Baisakh* (April-May), due to their belief that they may not hunt animals in these months. A kind of tuber known as *Githa kanda* is crushed and mixed with the latex of *Barga* (*Banyan* sp.) tree and the mixture is used as poison applied to the arrowheads. Among the Kamar tribe of Chhattisgarh the arrowhead is used for cutting the umbilical cord of newborn babies and the same arrowhead is presented to the midwife.

Tuma (Gourd container, Fig. 4 A-B)

This object is made up of gourd — an edible fruit, with a hard skin and a soft inside looking like a bottle or bowl. The fruit is often dried after taking out the soft material from inside. It is used by almost all tribal communities as a container for storing food grains.

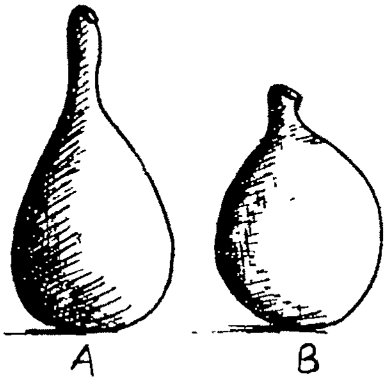

Fig. 4: *Tuma* (Gourd container)

The gourd varies in size. Generally, the bigger fruits are used for preservation of dry food, whereas the smaller ones are used for magico-religious purposes, especially by the Baiga tribal community of Madhya Pradesh. An assistant to a spiritist (*guni*) generally known as *Tumihar* usually uses this *tuma* (small dry gourd) for diagnosing the cause of illness. After getting possessed by the supernatural power the *Tumihar* can detect the actual evil spirit who is believed to be responsible for causing trouble. The *Tumihar,* who catches hold of the *tuma* in his hand, shakes his gourd vigorously backwards and forwards, giving an affirmative answer to the response of *guni's* recitation of *mantra* by taking the names of various gods and evil spirits.

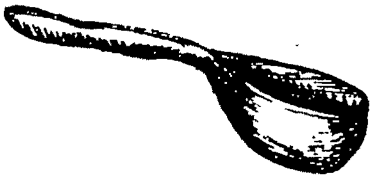

Fig. 5: Onka (Gourd bowl)

Onka (Gourd bowl, Fig. 5)

This object is also made up of gourd, dried under the sunlight. This looks like shallow bowl with a long handle and is used as a shallow bowl or ladle to take out water from a large water container. It also helps in serving water. However, now a days the water from the bowl is served in tumblers to guests.

Farsi (Battle axe, Fig. 6)

It is an object made up of wooden handle and iron blade. It is used as a weapon for sacrificing animals and birds

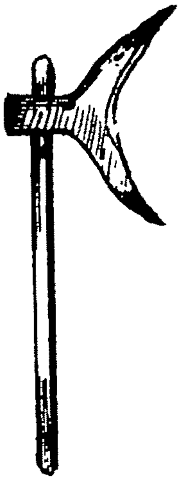

Fig. 6: Farsi (Battle axe)

during religious rites and rituals especially among the Santhal tribe. It is also seen that during marriage tribal people dance with this axe in their hands to counter the effect of evil eyes. This offensive weapon is no longer in use.

Conclusions

Each ethnographic object has its own cultural importance to the ethnic group which makes and uses it. The same object is fashioned according to the needs of that community. As the ethnographic objects mark the cultural identity of a particular ethnic group or community, these should be well preserved. The ethnographic museum can play a vital role for conserving cultural heritage through the collection of various ethnographic objects. Moreover, in order to store and preserve, for posterity, various types of objects used by people in contemporary cultural context, peoples' participation in this exercise is a must so that preservation of indigenous techniques and other knowledge systems can be done.

Acknowledgements

I am grateful to Dr. G.L. Badam and Shri. R.M. Nayal for their valuable suggestions and continuous support, which enabled me to complete this note. Thanks are due to Shri. M. Rehan for technical help.

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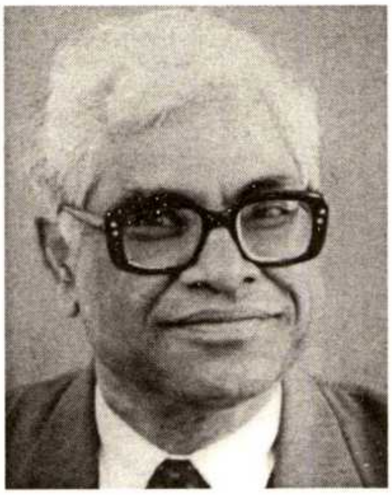
Obituary



Professor Ajay Mitra Shastri
(1934-2002)

Professor A.M. Shastri breathed his last on 11th March 2002. His untimely death is shocking because we were together at New Delhi from 7th to 9th March attending an ICHR workshop.

Dr. Shastri was born at Guna (M.P.) in 1934 and studied Sanskrit first traditionally at the Government College, Varanasi. Here he was awarded the degree of 'Shastri', which has become his surname (original surname was Upadhyaya). Later he studied ancient Indian culture at Benaras Hindu University, where he earned M.A. degree (1957). In 1964 he got Ph.D. from Nagpur University for his thesis on '*kuttanimatam*' under Prof. V.V. Misrashi. He joined Nagpur University as a Lecturer, became Reader in 1964 and finally Professor and Head of the Department of Ancient Indian History, Culture and Archaeology.

Dr. Shastri's contribution to the studies in ancient Indian culture is considerable. Of his many important publications, mention should be made of '*Kuttanimatam — a Cultural Study*, '*Brihat Smahita of Varaha Mihir*' (2 volumes), *Corpus of Mitra coins of Kausambi*, *Inscriptions of Sarabha-purias, Somavamshis and Panduvamshis* (2 volumes), *Coinage of the Satavahanas*, *The Age of the Vakatakas*, besides Pauni and Bhokardhan excavation reports, of which he was a co-author. He also edited volumes on Satavahanas and Vakatakas. He has over 200 research papers to his credit, mostly in the field of numismatics and epigraphy, which was his forte because of his unique combination of Sanskrit and ancient history.

Honours were showered on Dr. Shastri which include gold and silver medals by Asiatic Society of Bombay and Numismatic Society of India and many others. He was sectional President of Indian History Congress (1978), A.P. History Congress (1980), Maharashtra Itihas Parishad (1986) and General President, Numismatic Society of India (1981), and Epigraphic Society of India (1987). He was honoured by a couple of *Fetschrifts* by his students and colleagues.

The world of Indology has become poorer in the death of Professor Shastri.

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The editorial committee thanks Dr. Chandrashekhar Gupta of Nagpur University for providing photograph of late Prof. Shastri.

Obituary

Shiba Charan Nanda
(1950–2002)

It is in deep sorrow that I am writing about the sad and untimely demise of a dear friend Dr. Shiba Charan Nanda, known to most of his colleagues and friend as simply 'Nanda'. He was born at Cuttack, Orissa in a highly educated family and died at Bhubaneswar after a brief illness. He leaves behind his wife, Seema, parents, a brother and seven sisters.

Nanda graduated from B.J.B. College, Bhubaneswar. For postgraduate studies he joined the Department of Anthropology, Utkal University, where he completed his M.Sc. Degree in 1973. During the early part of 1974, he joined Deccan College, Pune and began his research career under the guidance of Prof. V.N. Misra. He took up a challenging project to explore the inaccessible and densely forested Koraput district of Orissa. For the first time through systematic field investigations he brought to light 17 Upper Palaeolithic and 85 Mesolithic sites in a small geographical area of the Indravati basin. This was the first discovery of Upper Palaeolithic culture in Orissa. He also explored and recorded some Mesolithic sites in the Daitari region of Keonjhar district. His prehistoric investigations in the Indravati basin in Koraput made him travel to remote areas inhabited by various tribes like the Gadabas, Bondos, Parajas and Saoras. To explain the archaeological findings, human adaptation and subsistence strategies, he undertook a systematic ethnoarchaeological study of the region and specifically studied the Gadabas.

While pursuing his research, he worked as a research assistant in the Bhimbetka excavation project from 1976-80. His expertise in prehistoric excavations and tool analysis under the guidance of Prof. Misra was thoroughly used by his contemporary friends working on prehistory at the Deccan College and also from other universities. His friends openly acknowledge and cherish his help to them in various ways. I knew him from our school days and found him an easy going righteous person till his last days.

Nanda submitted his dissertation on *The Stone Age Cultures of the Indravati Basin, Koraput District, Orissa* to the Poona University and got his Ph.D. degree in 1984. Soon after that he joined the Department of Anthropology, Ispat college, Rourkela, Orissa, where he worked till 2000. Two years back he was transferred to the Kamala Nehru Women's College, Bhubaneswar, where he served till his death. At the time of his death he was involved in many developmental works of his college. Though he was not very much active in research after shifting to Orissa, he was always a source of encouragement to scholars working in that region. Before his demise a major research project was initiated, in which he was going to be associated in investigating the prehistoric archaeology of Mayurbhanj and Keonjhar districts with Prof. K.K. Basa of Utkal University and Prof. Subrato Chakrabarti of Visva Bharati University, Santiniketan.

He was a simple, polite and soft-spoken person and a very good friend in the true sense. I don't know anyone who spoke ill of him. He was a member of the Indian Society for Prehistoric and Quaternary Studies from the beginning and had many academic friends. The faculty, students, staff, and friends from the Deccan College, and the archaeologists working in different Indian universities, deeply mourn the sudden and untimely death of a scholar and extraordinarily fine gentleman.

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Obituary

Bindeshwari Prasad Sinha
(1917–2002)

The passing away of Professor B.P. Sinha on third May, 2002 at Patna, following a bypass surgery, from which he had initially recovered, is a great loss to Indian History and Archaeology. Professor Sinha was one of the seniormost and most respected archaeologists of the country, and he is mourned by the entire community of historians and archaeologists.

Prof. Sinha was born on 11th March, 1917 at Biharsharif in Nalanda district of Bihar. He had his schooling in the Nalanda College at Biharsharif, and later education at Patna College. He passed B.A. (Hons.) in History in First Class in 1939, and M.A. in History, also in First Class, in 1941, securing first position in the class. He obtained his Ph.D. degree in History from London University in 1948 for his thesis on 'Decline of the Kingdom of Magadh c. 455-1000 A.D.' under the supervision of the famous Indologist, L.D. Barnett.

B.P. Sinha began his teaching career in 1942 and served as a Lecturer in History in the H.P. Jain College, Arrah, Rajendra College, Chhapra, and B.N. College, Patna. He joined Patna College in 1944 and soon became well-known as a popular teacher. When a Department of Ancient Indian History and Culture was opened in the Patna University, with eminent Indologist, A.S. Altekar as its Head, Dr. Sinha was transferred there as a reader. Later, in 1958, when Altekar left the University to accept the directorship of the K.P. Jayaswal Research Institute, Sinha was nominated Head of the University Department, and in the following year he was promoted to Professor. He held these positions up to 1981. In 1959 the UGC selected his Department as one of the five departments in the country to provide special grants for teaching and research in archaeology, and it started undertaking archaeological excavation. From 1962 to 1974. Dr. Sinha was Honorary Director of the Department of Archaeology and Museums of the Bihar Government. He also held the positions of Honorary Director, and Research Fellow of K.P. Jayaswal Institute, and Honorary General Secretary of Bihar's State Regional Records Survey Committee.

Dr. Sinha conducted excavations at several sites. These include Antichak, the site of the famous Vikramashila University, Apsad in Nalanda district, where he exposed a Vishnu temple of the 7th century A.D., Champa in Bhagalpur district, where he uncovered an ancient city with huge ramparts, and antiquities of the Mauryan and Gupta periods, Balirajgarh in Madhubani district, which revealed huge rampart walls and antiquities of the 3rd-2nd century B.C., and the Palaeolithic site of Lotapahar in Singhbhum district. Dr. Sinha was associated with a number of learned societies in various capacities. These include Fellowship of the Royal Society, London, member of several research institutes in Bihar, member of the Preliminary Organising Committee of the First Asian History Congress held at Delhi, Honorary Treasurer of the Indian History Congress, President of the Ancient India section of the Indian History Congress, Indian Archaeological Society, and Numismatic Society of India, and Chairman of the Indian Society for Prehistoric and Quaternary Studies.

Dr. Sinha was awarded the prestigious V.S. Wakankar Award by the Indian Archaeological Society, and was invited to deliver the prestigious H.D. Sankalia Memorial Lecture of the Indian Society for Prehistoric and Quaternary Studies at the Society's annual conference held at Rohilkhand University, Bareilly in 1993.

Dr. Sinha participated in numerous national and international conferences of History and Archaeology. These include Paris, Delhi and Canberra sessions of the International Orientalists Congress, and World Archaeological Congress–3, held at New Delhi in 1994. He chaired many sessions of various national and international conferences held in the country. He organized the annual conference of the Indian Archaeological Society under the auspices of his Department in 1968, and a seminar on Potteries in Ancient India in 1967.

Dr. Sinha visited U.S.A. as Visiting Asian Professor in 1966, and Bulgaria and Yugoslavia as a member of the Government of India cultural delegation in 1967.

He supervised the Ph.D. thesis of 12 students on different aspects of Indian history, culture and archaeology. A number of his students came to occupy important positions in universities, research institutions, and Central and State governments.

Besides nearly 100 research papers published in various and international journals and in edited volumes, Dr Sinha wrote and edited a number of books which stand testimony to his scholarship. The following are his major publications.

01. 1954. *Decline of the Kingdom of Magadha 455-1000 A.D.*
02. 1958. *Bharatiya Kala ko Bihar ki Den.*
03. 1968. (Ed.) *Potteries in Ancient India.*
04. (Ed.) *Comprehensive History of Bihar*, Vol. I, Parts I and II
05. 1977. *Readings in Kautilya's Arthasastra.*
06. 1978. *Dynastic History of Magadha.*
07. 1978. *Readings in History and Culture*
08. 1979.*Archaeology and Art of Bihar.*
09. 1988. *Archaeology in Bihar.*
10. *Bihar ka Rajnitik Itihas.*
11. *Prachin Bharat ka Itihasa.* (with S.S. Sahay)
12. 1993. *Twilight of the Imperial Guptas.*
13. *Excavations at Vaisali.* (with S.R. Rai)
14. *Excavations at Pataliputra.* (with L.A. Narayan)

Apart from his academic interests, Dr. Sinha was keenly involved in the development of modern Bihar. While in England in 1946, he established Bihar State Scholars' Association, for helping young scholars going to England for higher studies. In 1950 he formed *Anushilan Parishad,* a multi-disciplinary academic body for sharing knowledge of various disciplines and for discussing the problems of Bihar and formulating schemes for solving them. Dr. Sinha formed a Council for Social Affairs under the patronage of Shri Jaya Prakash Narain and Shri Baldeva Sahay. The Council invited from time to time important public figures and thinkers to address the members on burning political, economic and social problems. It was at one of these meetings that Jaya Prakash Narain discussed his idea of a partyless democracy.

I had the privilege of knowing Dr. Sinha for the last thirty-five years. I first met him during the annual conference of the Indian Archaeological Society at Patna in 1968, and after that I was meeting him almost every year during the joint annual conference of the Indian Archaeological Society, Indian Society for Prehistoric and Quaternary Studies, and Indian History and Culture Society. I do not remember him missing a single conference. He took the conference very seriously and sat through the academic sessions the whole day, attentively listening to all papers and taking an active part in the discussions even when he was over eighty years of age. He had a remarkably sharp memory and an alert mind till the end, and remembered incidents many decades old as well historical and archaeological facts with perfect precision. He was highly respected for his scholarship and kind and affectionate nature by young and old scholars like. He often presided over the valedictory functions of the conference and over the General Body meetings of the three societies at which the triennial elections of the Executive Committees of the Societies were held. Whatever names he suggested for different positions were unanimously accepted by all the members.

As a person Dr. Sinha was extremely unassuming, simple, polite and affectionate to everyone. He bore his scholarship very lightly, without the slightest trace of ego, and was easily approachable to everyone. He had a lively sense of humour and was a very good conversationalist. Dr. Sinha was a quintessential family man and was blessed with a loving and devoted wife, Smt. Satyabhama, and children. In Dr. Sinha's advanced years Smt. Sinha always accompanied him to conferences and other places to look after him. The last conference of the Societies which he attended was the one held at the M.S. University of Baroda in November, 2001. Immediately after that he and Smt. Sinha came to Pune to visit their son, who is a Professor at the Gokhale Institute of Economics. On this occasion both of them, accompanied by their son and Swiss daughter-in-law, visited us at our home. Despite their old age and indifferent health they travelled by auto-rickshaw a distance of at least twenty kilometres and climbed the steps to our apartment. My wife and I were deeply touched by this affectionate gesture of Dr. and Smt. Sinha. Had they told me that they wished to see us, my wife and I would have happily gone to meet them at their son's residence. But it is such noble qualities which made Dr. Sinha different from many other scholars.

For his immense and abiding contribution to Indian history, culture and archaeology as well as for his rich human qualities Dr. Sinha will be remembered by his numerous admirers for all time to come.

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Obituary

Peter Francis Jr.
(1945–2002)

It is with profound grief that we place on record the sad demise of Peter Francis Jr. the bead man, the Director of Center for Bead Research, TheBeadSite.com and Bead Expo (biennial conferences) on December 8, 2002 at Ghana, West Africa, while working on a research project on beads.

Born at Ellsworth, Kansas, U.S.A. on August 6, 1945 Francis Jr. attended the Ellsworth school system and graduated in 1963. He attended Park College in Kansas city and earned his master's degree from the General Theological Seminary in New York City. He got his training in archaeology at the Deccan College Post-Graduate and Research Institute, Pune, India. Although he did not have a formal degree in Archaeology, all over the world he is considered as the father of modern bead studies. After Horace C. Beck no researcher other than Francis Jr. has made the study of beads so fascinating and interdisciplinary. His studies did not have any material, time and space boundary. He travelled to many parts of the world seeking material on beads. He was interested in what they were made of, how they were made, where they were made, who made/makes them, who used/uses them, what were/are their uses and how they travelled throughout the world. Francis Jr. intellectual life surprised many. He had pursued his interest fervently. He was a collector - not only of beads but of the stories and contexts which gave them meaning. More than any other researcher, he emphasized that it is not the beads themselves but the people and cultures for whom they hold significance, that are important. In his efforts to more fully understand these contexts, Francis Jr. immersed himself in many cultures, and fittingly — perhaps as he would have wished it — died on a bead study trip. In the end he outdistanced Beck with his publication of about 400 research articles in many reputed academic journals and dozens of books on beads.

The New York Times has honoured Francis Jr. for his scholarship on the subject. He worked for and with many museums, including the Smithsonian and the London Museum, as well as museums in Denver, New York, Egypt, India and Africa. Francis Jr. received many grants and prizes for his work, such as the New York State Historical Association Kerr History Prize, the Dorothy Wetmore Gerity Prize, the Smithsonian Travel Grant, the Hagop Kevorkian Fund, the Asian Arts Council (Rockefeller Foundation) Grant, the Alden B. Dow Creativity Fellowship from Alden B. Dow Foundation, the UNESCO Silk Roads Participant Grant, Dorothy Wetmore Gerrity Prize for Bead Research and many grants from organisations like the Bead Society of Los Angeles, Portland Bead Society, Bead Society of Greater Chicago, Northwest Bead Society, Bead Society of Greater Washington and Bead Study Trust.

Francis Jr., in his zeal to inform people about the fascinating world of beads, about the potential they could bring forth in the individual, and about the unbroken line of creativity that extends from 40,000 years ago to today, was almost like a missionary. He was far ahead of his time which resulted in biannual symposium on beads since 1992 and the most popular and largest website on beads, thebeadsite.com since 1997. It is not wrong to say that he single-handedly made the study of beads popular next only that of pottery in archaeology. His contribution in solving the problem of Indo-Pacific beads and its importance will be greatly remembered. His contributions on other areas of bead study are also of equal importance.

While in the United States Francis Jr. resided with his parents, Reverend Peter and Phyllis Francis in Lake Placid, where he did his writing and directed his other business with the bead world.

Every person who knew Francis Jr. learnt some aspect of history and human achievement through beads. Peter Francis Jr. was truly one-of-a-kind. His spirit, dedication, and focus will be greatly missed. May all of our thoughts speed him on his way and may he find the peace that he sincerely wished for everybody through his consistent signature "Peace" before 'Pete'.

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Book Review

Temples of the Kalachuri Period. 2002 Amrendra Kumar Singh. Delhi: Pratibha Prakashan. Pages 118, Plates 90. Price Rs. 1650

The Kalachuris, also known as Katachhuri, Katachchuri, Kalatsuri, Chedi, and Haihaya, are one of the important dynasties of medieval India. Different branches of the dynasty ruled over a large part of the country, particularly of central India, for nearly 1200 years from the middle of the sixth century onwards. There were five branches of the dynasty, namely the Kalachuris of Malwa with their capital at Mahishmati or Maheshwar; of Gujarat with their capital at Anandpur, of Dahal with their capital at Tripuri, of south Kosala with their capital at Tummana and Ratanapura, and of Kalyana and Saryupara. The Tripuri house enjoyed the greatest fame and ruled an extensive empire, subsequently known as Chedimandala and Dahalamandala. The author has given detailed political history of the Kalachuris and names and periods of reign of all their important kings.

The Kalachuri rulers were great patrons of architecture and art. Their inscriptions mention that they built *vyakhyanshalas* (lecture halls), *sattras* (charitable feeding houses), gardens, temples, monasteries, colleges, *choultries* (buildings for distribution of food), maternity homes, and hospitals, and embellished the temples with beautiful sculptures of gods and goddesses. Many of these monuments, mainly temples, have survived but often in a dilapidated condition. These monuments are found mainly in central and eastern Madhya Pradesh, including Chhattisgarh, the new State carved out of Madhya Pradesh. They were first surveyed by R.D. Banerjee in the early part of the last century. Banerjee classified them into the following three groups on the basis of their relative age, and the kings under whose patronage they were built: (1) the earliest group erected during the reigns of Yuvarajadeva I, Lakshmanaraja and Yuvarajadeva II, the ruins of which are present at Gurgi, Chandrehe, Bilhari, Bheraghat, and Chhoti Deori; (2) erected during the reign of Karnadeva and his immediate predecessor and successor, and found at Sohagpur, Amarkantaka, Baijanath, and Marai; and (3) latest in age and showing decadence, and built during the reigns of Narsimhdeva, Jaysimhdeva, and Vijaysimhdeva, and found at Bheraghat and Deo Talava. According to Krishna Deva, however, the Bandhogarh temples, belonging to 7th-8th centuries A.D., are the earliest, followed by the Baijnath temple at Bela, which belongs to the 9th century A.D. The tenth century Dahala witnessed the maximum temple building activity, and the temples of this period are known from Arjula, Chandrehe, Gurgi, Mahsaun, Kharjuha, Maihar, Nohta, Tewar, Bilhari and Marai. The eleventh century temples are represented at Sohagpur and Amarkantak. On the basis of sculptures R.N. Mishra considers the Bandhogarh temples to be the oldest, followed by those of Gurgi, Chandrehe, and Rewa and its vicinity.

The temple building activity in central India started in the 6th-7th centuries A.D. This early phase is represented by the monolithic temples at Mada, the archaic temple at Boudh Danda, Sitamadhi group of temples, and the brick temple at Madfe. This dating is based purely on architectural and sculptural styles. Temples dated to 8th-9th centuries are represented at Bandhogarh, Bela and Deour Kothar. The second phase of construction, dated to 10th century A.D., is represented by the temples at Arjula, Gurgi, Mahsaun, Chandrehe, Khajuha, Maihar, Nohta, Tewar, Bilhari, Marai, Patianadai, Kunwara Matha, Manpur, Rehi, and Bagdehi during the period of the *Pashupata* and *Shaiva-Siddhantika* school of Shaivism. The third phase, belonging to the 11th century, is represented by the temples and monastery at Sohagpur, Amarkantak, Lilaha and Chunari. The last phase, belonging to 12th-13th century, is marked by decadence, and is represented by the Deo Talva temple.

The author carried out an extensive survey of the temples and other structures, which are difficult to access as they are located in a hilly and forested environment. He deserves to be strongly commended for his labours and devotion.

The author has given a description of the main components of the temples, namely *garbhagriha*, *antarala*, *mandapa*, elevation, *vedibandha*, *jangha*, *varandika*, *shikhara*, and *sukanasika*. The major portion of the book is devoted to a detailed description of the horizontal plan and elevation of all the important temples of the region. These comprise the monolithic temples of Mada, group temples of Boudha Danda and Sitamadhi, brick temple of Madfe Danda, group temples of Bandhogarh, Devi temple of Deour Kothar, Shiva temple of Khokhala, Baijnath temple of Bela, Shiva temples of Rehi, Baghedi, Mahsaun, Chandrehe, Shaiva monastery of Chandrehe, Jaina temple of Pataura, Kunwara Matha temple of Jaso, Jwalamukhi temple of Manpur, Shiva temple of Nohata, monastic complex of Chunari, Gola Matha temple of Maihar, Shiva temple of Khajuha, Torana of Rewa, Viswanatha temple of Maribagh, Chaturmukha Mahadeva temple of Nachna, Chausatha Yogini temple of Bheraghat, Shiva temples of Majhiyar and Lilaha, Viratesvara temple of Sohagpur, Triayatana, Kesavanarayana, Machchhendranath, and Patalesvara temples of Amarkantak, Somnatha temple of Deotaalva, Deour Kota temple of Semara, and group temples of Turra Natha (Rauhal).

The text is supplemented by good quality drawings of plans and elevations and photographs of most of the temples and other structures, a bibliography and index. A comprehensive glossary of architectural and sculptural terms in Sanskrit and their explanation in English considerably adds to the value of the book. Dr. Singh has made an original and important contribution to the study of Kalachuri temple architecture of central India for which he deserves congratulations. The book will be found extremely useful by all students of temple art and architecture.

The author should have provided a summary of his findings at the end of the book, and also got the language edited by a competent person.

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Book Review

God-Apes and Fossil Men: Paleoanthropology in South Asia. 2000. Kenneth A.R. Kennedy. Ann Arbor: The University of Michigan Press. Pages 480, Illustrations 50. Price, not given.

Research in Indian archaeology, as indeed in every other field of knowledge, began only after the founding of the Asiatic Society by Sir William Jones in 1784 at Calcutta. Initially, it was carried out only by the members of the Society, who were officers of the East India Company. The first colleges, namely the Presidency College, Calcutta and the Presidency College, Madras were established in 1817, and the Deccan College, Poona in 1821. The first universities, namely those of Bombay, Calcutta and Madras, were established in 1857. Slowly, departments of Zoology, Geology, Botany and other Science disciplines as well as of Humanities and Social Sciences were established in these universities and in the colleges affiliated to them. The Geological Survey of India was established in 1851, the Archaeological Survey in 1860, the Zoological Survey in 1916 and the Anthropological Survey in 1946.

The first stone tool, a biface, was discovered by Robert Bruce Foote of the Geological Survey of India at Pallavaram, near Madras in Chingleput district of the Madras Presidency on 31st May 1863. In the following four decades or so Bruce Foote discovered over 460 Palaeolithic sites and over 250 Mesolithic, Neolithic and historic sites in several parts of south India as well as in Gujarat. Bruce Foote, as well as his son, H.B. Foote excavated several limestone caves at Billa Surgam in the Kurnool District of the present-day State of Andhra Pradesh, and discovered rich Upper Pleistocene fauna, many bones with cut marks, and true bone implements. Bruce Foote made a large collection of antiquities of all categories. He eventually sold them to Madras Government which housed them in a specially built hall in the Madras Museum. He classified them systematically and wrote notes on them which reveal uncanny and precocious insights of the author. The classification and notes were published in two sumptuously illustrated volumes by the Museum in 1914 and 1916.

Even before 1820 Megalithic monuments in the form of menhirs, dolmenoid cists and boulder circles had been discovered and excavated in parts of South India, and they had yielded human skeletons and grave goods of iron, pottery, and other objects.

Meadows Taylor, Resident at the Shorapur Durbar in the present-day Gulbarga district of Karnataka, had discovered Megalithic monuments in the Nilgiri hills from 1851 onwards. Ash mounds, typical of the South Indian Neolithic culture, were discovered by the 1830s and already several theories were propounded for their origin. Capt. T.J. Newbold rejected all of them in 1836 and held the view that the ash mounds were funerary places even though human bones had not been encountered in them.

J. Cockburn and J.H. Rivett-Carnac had discovered Palaeolithic and Mesolithic artefacts in the hilly and rocky districts of Banda and Mirzapur in the United Provinces and Central India from 1874 onwards. A.C.L. Carlleyle, an assistant of General Alexander Cunningham, the founder Director-General of the Archaeological Survey of India, discovered microliths, distinctive components of Mesolithic technology, in the caves and rock shelters in the Mirzapur district. Subsequently, in 1980-81 he excavated some of these shelters and came across living floors containing animal bones, human burials, various kinds of stone objects, and hearths containing ash and charcoal (Brown 1889; Smith 1906). On the walls and ceilings of these shelters Carlleyle noticed paintings which appeared to him "to illustrate in a very stiff and archaic manner scenes in the life of the ancient stone chippers; others represent animals or hunts of animals by men armed with bows and arrows, spears and hatchets" (Smith 1906: 187).

From the beginning of the nineteenth century copper objects, comprising rectangular, shouldered, and double-edged axes, harpoons, anthropomorphic figures, bar-celts, hatchets or *parsu*-like objects, spearheads, antennae-hilted swords and occasionally rings, were discovered as accidental finds at many places in the Ganga-Yamuna doab, and they came to be known as 'Copper Hoards'. In 1921-22 Indus Civilization was discovered, following excavations at Mohenjodaro and Harappa. In the ensuing years a number of sites of this Civilization were discovered in Sind and a few in the Punjab by N.G. Majumdar, Aurel Stein and M.S. Vats.

Since 1833 vertebrate fossils began to be discovered in the Quaternary alluvial deposits of the Narmada river by G.G. Spillsbury, W. Theobald, W.T. Blanford, T. Oldham, R.D. Oldham, and J.G. Medlicott. Around the same time P.T. Cautley, Hugh Falconer, W.E. Baker, H.M. Durand and others began collecting animal, including primate, fossils from the Siwalik hills of north India.

After the partition of India and creation of two independent nations of India and Pakistan in 1947 there was a considerable expansion of the Archaeological Survey of India, with a number of regional circles, including several excavation branches, being set up. Also, a large number of universities with departments of archaeology and anthropology were established. Besides, some specialised institutions for research in archaeology and two laboratories with facilities for radiocarbon and thermoluminiscence dating were established at Bombay and Lucknow.

Consequent upon the expansion of the Archaeological Survey and establishment of new Archaeology and Anthropology departments in the universities, there was a remarkable expansion in exploration and excavation activities, particularly in the field of the Indus Civilization. Several thousand sites of the Palaeolithic, Mesolithic, Neolithic, Chalcolithic, Iron Age, including Megalithic and historic periods, were discovered, and several hundred of them excavated on varying scales. Many of them have also yielded human skeletal remains from burials. As a result of this increased tempo of exploration and excavation there has been a dramatic increase in our knowledge of South Asian prehistory, including biological anthropology of ancient populations.

The first general book on South Asian prehistory, entitled *Prehistoric India: Its Place in the World's Culture*, by Panchanan Mitra appeared in 1923. Two more editions of the book came out in 1926 and 1927. Since then from time to time a number of syntheses of the subject have appeared. These include books by Stuart Piggott (1950), F.E. Zeuner (1951), B. Subbarao (1956, 1958), D.H. Gordon (1958), Sir Mortimer Wheeler (1959), H.D. Sankalia (1962, 1963, 1974, 1977, 1979), B. and R. Allchin (1968, 1982, 1997), W.A. Fairservis (1975), D.P. Agrawal (1982), and D.P. Agrawal and J.S. Kharakwal (2002).

While each of these books gives a comprehensive and excellent review of the information available at the time of its writing, none of them can match the book under review in the vastness of scope and wealth of information. It is not a normal book but a veritable encyclopaedia of South Asia's prehistoric past – both biological and cultural. Besides, it contains a lot of information about the present biological and cultural scene as well. Some idea of the book's scope can be had from basic statistics. It has a bibliography of 67 pages containing over 2000 references in English as well as in several European languages, like French, German, Swedish, Russian, Flemish, Spanish, Italian and Moravian, as also some Indian languages. The author has located references from obscure and regional journals with limited circulation and books published from the seventeenth century onwards. The amount of reading he has done for writing the book is simply incredible. He has read virtually every publication relating to South Asia's prehistory, history, anthropology, animal and human palaeontology, genetics and languages. The subject index includes over 350 major topics, besides a much larger number of sub-topics. The author index includes more than 1000 names.

The author, Kenneth A.R. Kennedy, is professor of biological anthropology in the Department of Ecology and Evolutionary biology at the Cornell University. He was trained in biological anthropology by the eminent anthropologist, T.D. McCown, who worked in, besides other areas, the Narmada valley in India. The book is aptly dedicated to him.

The author has been actively involved in research on South Asian palaeoanthropology since the early sixties of the last century. He has studied human skeletal remains from the Palaeolithic site of Hathnora in the Narmada valley, Palaeolithic-Early historic site of Bhimbetka in Madhya Pradesh, Mesolithic sites of Langhnaj in Gujarat, Bagor in Rajasthan, Baghai Khor, Sarai Nahar Rai, Mahadaha and Damdama in Uttar Pradesh, Chalcolithic and Indo-Roman site of Nevasa in Maharashtra, Megalithic sites of Raigir and Yelleswaram in Andhra Pradesh, Adittanalur and Pochampad in Tamil Nadu, and Naikund in Maharashtra, and historical site of Ruamgarh in Bihar, all in India; Indus Civilization site of Harappa in Pakistan; and Mesolithic cave sites of Bata Domba Lena, Beli Lena and Fa-Hien in Sri Lanka. Besides, he has studied the skeletons of the living tribal populations of the Veddas and Balangodese in Sri Lanka. He has systematically published the results of all his researches. Besides being individual or joint author of several monographs on human skeletal remains from several prehistoric sites, he has published a large number of research papers in prestigious international journals. He is also author of a book on the Neanderthals. He has also trained a large number of young researchers in biological anthropology, all of whom are actively engaged in the study of human skeletal remains from South Asian archaeological sites. Without any doubt the author is today the leading authority on the palaeoanthropology of South Asia.

Kennedy's interest in palaeoanthropology is not confined to morphometric analysis of human skeletons, but includes palaeopathology, palaeodemography, statistical analysis, and adaptations of ancient populations to specific ecological settings. Outside palaeoanthropology his research interests include the biography of the Sanskritist and linguist, Sir William Jones, and the Aryans.

The book consists of 18 chapters. Each chapter opens with a quotation from the publication of an eminent archaeologist, anthropologist or palaeontologist. Chapter 1 gives an account of the formation of the South Asian landmass during remote geological times. It traces the history of the various names given to this landmass like Bharata, or Bharata-Varsha, and India, and to its constituent nation states of India, Pakistan, Nepal, Bangladesh, Bhutan and Sri Lanka. It also describes the major geographical units, namely the Himalayas and their constituent parts, the vast Indus-Ganga-Brahmaputra alluvial plain, the hilly, rocky and forested region of peninsular India, and the hills of the Eastern and Western Ghats and their associated coastal plains, rainfall, drainage, religions and languages. The text is supplemented by two maps of the political divisions, and geographical and cultural regions of South Asia.

A sub-section of the chapter, entitled Gondwanaland, discusses the theory of plate tectonics, propounded by the German geologist, Alfred L. Wegener, and gives a list of the geological eras, periods and epochs. It is supplemented by two maps, showing the splitting of the supercontinent of Gondwanaland or Pangaea between 200 and 50 million years ago.

Chapter 2 gives an account of the discovery of the first Palaeolithic implement at Pallavaram, near Madras, by Robert Bruce Foote, in 1863, Foote's work with William King in the Cortiliar (Kortallayar) valley, and with his son, H.B. Foote, at Billa Surgam; discoveries of Megalithic monuments in South India before the 1820s; the legacy of Sir William Jones, often called "Oriental Jones" or "Persian Jones", and "father of Indology", his founding of the Asiatic Society, identification of Sandracottus with Alexander the Great, translations of Indian poems from Persian sources as well as of Sanskrit works, including Kalidasa's *Abhigyan Shakuntalam*, and creating a *British Indomania;* founding of the Asiatic Society of Great Britain and Ireland by Thomas Colebrooke in 1823, and its branches in Madras, Colombo and Singapore; founding of the Literary Society of Bombay by James Mackintosh in 1804, the Russian Asiatic Academy (1810), the Societe Asiatique (1822), the American Oriental Society (1842), the Deutsche Morganlandische Gesellschaft (1845), the Ceylon Society (1845), and the Siam Society (1904).

The last sub-section of the chapter discusses the background of European prehistory. It covers the geological research during the eighteenth century by German, French and British geologists, William Buckland's thesis of a Universal Deluge and his reference to the discovery of mammalian fossils in the Himalayas, founding of the Geological Society of London in 1807, publication of Sir Charles Lyell's book, *The Geological Evidences of the Antiquity of Man with Remarks on Theories of the Origin of Species by Variation*, in 1863. This year also saw the publication of T.H. Huxley's book, *Evidence as to Man's place in Nature*, which enlisted comparative anatomy into the hypothesis that the living anthropoid apes are our closest relatives among the primates.

There are a few other years of the nineteenth century, which are landmarks in the study of palaeoanthropology. One of them is 1836. In this year Christian Jurgensen Thomsen, Curator of the National Museum of Denmark in Copenhagen, proposed the Three Age System of Stone, Bronze and Iron Ages for arranging the antiquities, collected from different places in Denmark by Rasmus Nyerup, librarian of the University of Copenhagen. In 1865 John Lubbock of England divided the stone age into two periods, Palaeolithic and Neolithic in his book, *Prehistoric Times*. While the Palaeolithic was characterized by chipped stone tools and bones of wild animals, indicative of a hunting-gathering economy, Neolithic was marked by ground stone tools, bones of domesticated animals, charred seeds of cultivated crops, and pottery, all showing an economy based on animal husbandry and plant agriculture. Discoveries in rockshelters in the Vindhya hills in India and in caves in France of microliths and faunal remains led John Allen Brown to propose in 1892 the existence of an intermediate stone age, namely Mesolithic, between the Palaeolithic and Neolithic. By this time Palaeolithic period came to be divided into three sub-periods, namely Lower, Middle and Upper, each comprising several cultures, mainly discovered in France.

The second important year is 1859, which saw the confirmation of the amateur French archaeologist, Jacques Boucher de Perthes' claims of discovering chipped stone tools in association with fossilized bones of extinct mammals in the ancient alluvial deposits of the Somme river at Abbeville, by three eminent British scientists, namely geologists, Hugh Falconer and Joseph Prestwich and archaeologist, John Evans, after inspecting the stone tools, fossils and geological stratigraphy at the site. This year also saw the publication of Robert Charles Darwin's epoch making book, *The Origin of Species*, in which he propounded the theory of biological evolution by natural selection.

This sub-section also gives an account of the archaeological discoveries in South Asia by a number of amateur archaeologists, like A.B. Wynne, C. Hackett, H.P. Le Mesurier, W. Theobald, John Swiney and Bruce Foote in India, by John Pole, F.R.C. Read, P.B. and F. Sarasin and Herbert and Nora Noone in Sri Lanka, and by W. Theobald, Fritz Noetling and T.O. Morris in Burma.

Chapter 3 discusses, among other things, the rise and elaboration of the theory of evolution. It lists the contribution of Charles Darwin's precursors and contemporaries, like Comte de Buffon, Jean Baptiste Pierre Antoine de Monet de Lamarck, Charles Darwin's own grandfather, Erasmus Darwin, and others to the birth of the theory. Charles Darwin's contribution was not so much the invention of the theory of evolution but rather the discovery that natural selection is a mechanism whereby living species have descended from ancestral species with physical and behavioural modifications. In his book, *The Descent of Man*, published in 1871, Darwin proposed that sexual selection or preferential mating was another important evolutionary process that brought about the diversity seen in living organisms.

Unknown to Darwin, a Moravian monk, Gregor Mendel, had discovered the laws of inheritance through his experiments on plants. A controversy arose between the biologists, who supported Darwin's idea that organic evolution was a gradual process with natural selection operating under minor hereditary variations, and others who argued that evolutionary changes were marked by discontinuity and abrupt mutative leaps. In due course a synthesis of these two opposing views was achieved.

The penultimate sub-section of the chapter gives a detailed account of the discoveries of animal fossils and human bones in South Asian countries during the nineteenth and early twentieth centuries. The last sub-section discusses the various methods of classification of human bones and development of the ideas of races, and finally rejection of the concept of race by biological anthropologists around the middle of the twentieth century, following the initiative of Sherwood L. Washburn. The chapter also gives the latest views of hominid evolution and the current evolutionary status of the fossils of various genera and species, and finally a summary of the development of archaeological and related institutions in South Asia.

Chapter 4 is devoted to a discussion of the various theories regarding the invasions and/or migrations of the Aryans into South Asia, the forest dwelling communities, with special emphasis on the Veddas of Sri Lanka, and the European ideas of ethnogenesis.

Chapter 5 gives a detailed account of the Miocene hominoid fossils or God-apes of the Siwalik hills, their geological context, history of their discovery, elevation of the *Ramapithecus* to hominid status and his eventual dethronement from that pedestal, discovery and status of *Gigantopithecus*, position of Siwalik hominoids in the global context, and the current phylogenetic status of *Ramapithecus*.

Chapters 6 and 7 are devoted to a description of the Pleistocene geology and palaeoecology and Palaeolithic archaeology of India, Pakistan and Sri Lanka. The author has discussed the region-wise history of Palaeolithic research and given detailed regional accounts of various Palaeolithic cultures.

Chapter 8 gives an account of the South Asian Pleistocene fossil hominids. The author examines whether the hominid fossil from Hathnora in the Narmada valley belongs to *Homo erectus* or *Homo sapiens* stage of evolution. He also discusses the age of the fossil by comparing it with equivalent fossils from Africa and other regions, and a detailed account of the anatomically modern humans from South Asia, particularly from Sri Lanka.

Chapter 9 is devoted to a discussion of the post-Pleistocene climatic and landform changes in South Asia in the global context. Here the author's statement that "The present channels of the Ghaggar and Hakra systems do not represent the ancient Sarasvati, and the causes for its disappearance have been a subject of debate" is surprising. Since 1874 a number of authors have discussed the drying up of the Rigvedic Sarasvati, and there is a general consensus that the Sarasvati was a perennially flowing river because the Sutlej and the Yamuna were flowing through its channel. But once these rivers changed their courses southwestward and southeastward, respectively, the Sarasvati lost its water supply and eventually dried up (Misra 1994; also for bibliography). The author discusses the antiquity and development of microlithic technologies in Europe and South Asia, the origin of the concept of Mesolithic as a period transitional between the Palaeolithic and Neolithic, and the age of the microliths in South Asia on the basis of radiometric dates available from various sites.

Chapter 10 gives a comprehensive account of the discovery and distribution of Mesolithic sites in different regions of India and in Sri Lanka, particularly of the excavated ones like Lekhahia, Baghai Khor, Sarai Nahar Rai, Mahadaha, Damdama and Chopani Mando in Uttar Pradesh; rock shelters like Dorothy Deep at Pachmarhi in the Mahadeo hills, Bhimbetka and Adamgarh in Madhya Pradesh; Langhnaj, Akhaj, Valasna, and Hirpura in Gujarat; Bagor and Tilwara in Rajasthan, and Birbhanpur in West Bengal; and Beli Lena Athula, Beli Lena Kitulgala, Ravan Alle, Batadomba Lena, Fa Hien, Alu Galge, and Bellanbandi Palassa in Sri Lanka. It also gives a description of the stratigraphy and cultural finds as well as radiometric dates from the sites, and discusses the significance of the persistence of microlithic technology into the Chalcolithic and early Iron Age times as well as the symbiotic relationship between Mesolithic hunter-foragers and contemporary farmers. The chapter also describes the rock paintings associated with sites like Bhimbetka and Adamgarh.

Chapter 11 provides a very comprehensive account of the skeletal record of Mesolithic populations. This includes the anaemic woman from Baghai Khor who shows evidence of pathological markings on her frontal and parietal bones identified as porotic hyperostosis (symmetrical osteoporosis or spongy hyperostosis, 17 skeletons from Lekhahia ki Pahari, and a large number of excellently preserved skeletons from Sarai Nahar Rai, Mahadaha and Damdama. The Ganga valley skeletons "are impressive in appearance – large, heavily muscled, tall, and hyperrobust people who appear to have attained their full ontogenetic potential in a demanding hunting-foraging lifeway. When viewing photographs of these Gangetic hominids, the late Kenneth P. Oakley was moved to remark, "They look like European Cro-Magnon skeletons!". There are a few cases of pathological markings on the bones. The teeth of these skeletons, which have been intensively studied by J.R. Lukacs, K.A.R. Kennedy and their colleagues, are well-preserved and show low pathology.

According to the author, "Sarai Nahar Rai and Mahadaha skeletal specimens are representative of populations that shared a high frequency of discrete phenotypic characters of which some are under genetic control... It is likely that these similarities of phenotypic pattern represent close genetic affinities and gene flow between the Gangetic lake culture people of the Mesolithic, although random effects of drift and evolutionary parallelisms must not be overlooked. Perhaps the populations are regional enclaves of the same macropopulation and the degree of contemporaneity between them is not greater than that of a separation by a few generations .... In short, the phenotypic pattern of the Gangetic Mesolithic people is unique, and when comparative studies with other South Asian prehistoric populations were conducted it appeared that degrees of relationship are distant and that the people of Sarai Nahar Rai and Mahadaha contributed little biologically to later inhabitants of their region and beyond".

The concluding part of the above statement seems to be based on the author's unfamiliarity with the primitive communities of the region like the Kanjars, Nats, Beriyas, Baheliyas and Haburas who are unusually tall and sturdily built and clearly stand out among the other communities of the region. These people were traditional hunter-foragers, living a nomadic way of life but the encroachment of their habitat by farmers over the centuries forced them to take to a variety of other occupations like manufacturing items of rope, collecting honey and supplying them to farmers, providing entertainment to local settled population through dance, and indulging in prostitution and crime (Crooke 1896; Nagar and Misra 1989).

Other sites from which human skeletal material is described are Langhnaj, Bagor and Bhimbetka, and several sites from Sri Lanka.

Chapter 12 is devoted to early farming and pastoral cultures. The author discusses the origin of the concept of Neolithic, its characteristic features, various theories about the causes that led to the shift from hunting-foraging to food production, and advantages and disadvantages of food production as a new way of life. He also gives a brief account of the beginnings of agriculture in West Asia and China and lists the South Asian cultigens which were introduced from West Asia, Africa and southeast Asia.

In the context of the discussion on the beginnings of agriculture the author's statement that "The earliest examples of full-time plant and animal domestication in the Indian subcontinent are found at Sambhar, Lunkaransar, and Didwana in the vicinity of the saline lakes of western Rajasthan" is based on obsolete evidence. The late Gurdip Singh and his colleagues investigated the palynological history of the salt lakes of Rajasthan in the sixties of the last century and claimed to have discovered *Cerealia* type pollen which was interpreted by them as evidence of slash-and-burn agriculture. However, subsequent work in the Didwana lake by an Indo-Australian team (Wasson *et al.* 1983, 1984), in several lakes by M.D. Kajale (personal communication), and in the Lunkaransar lake by an Israeli-American-Indian team (Enzel *et al.* 1999) has totally failed to substantiate the claims of Singh and his team.

The chapter provides a detailed account of the findings of the excavations at Mehrgarh, the earliest farming-based settlement in the Indian subcontinent, sites in the Belan valley in central India, central Asia, Iran, Afghanistan and of the many village cultures in the narrow valleys of Baluchistan, Neolithic cultures of the Kashmir valley as revealed by the excavations at Burzahom and Gufkral, Neolithic finds from Mahisdal, Pandu Rajar Dhibi and other excavated sites in eastern India, and Daojali Hading in northeastern India. However, the excavated site of Sarutaru is not mentioned. The account also includes the Neolithic-Chalcolithic sites like Mahagara and Koldihwa on the Vindhyan plateau, south of the Ganga river, and the Neolithic sites and associated ashmounds of south India. At the end of the chapter the author gives an account of the impact of the food producing lifeway.

Chapter 13 is devoted to a detailed account of the human skeletal material recovered from the many early farming and pastoral sites in different parts of the subcontinent. These include Mehrgarh and Damb Sadaat in Pakistan, Darra-I-Kur in Afghanistan, Burzahom in Kashmir, and Brahmagiri, Piklihal, T. Narasipur, and Tekkalakota in south India. The account also includes morphological, dental and pathological features of the human skeletons. An interesting observation is the large crown area of the teeth of Mehrgarh inhabitants. This, according to the author, "may reflect retention of this trait of the Mesolithic populations of the Indian subcontinent where large dental structures were adapted to a coarse diet". The smaller tooth size at other Neolithic sites is attributed to relaxed selection for large tooth size as well as to advances in technology and refinement of food preparation methods and longer history of food production.

There are some interesting observations about the human skeletons from the Neolithic site of Burzahom. While in respect of some tool types and burial practices the Neolithic culture of Burzahom shows close affinity with central Asia and China, the biological features of Burzahom skeletons like dolichocranic cranial vaults, long and narrow faces, a low frequency of shovelling of incisor teeth, and tall stature are not representative of central and eastern Asian populations. Further, Burzahom skeletons also do no show similarity with those of the south Indian Neolithic sites. Rather, surprisingly, their closest affinities are with skeletons of the Mature Harappan cemetery R-37 from Harappa. This degree of biological relationship finds further support in the study of the dental remains from Burzahom. However, the author cautions us that "These findings should not be interpreted to mean that the ancient Harappans and Burzahomians were lineages of a single population. It is more probable that populations throughout northern India shared a higher frequency of genetic characters within this geographical sector of the subcontinent than they did with populations of peninsular India". Other interesting features of Burzahom adult skeletons are their high age of 51 to 56 years, male stature of 173 to 178 cm and female stature of 159 163 cm, and evidence of trephination.

The farming-based lifeway was not a total blessing; on the contrary, it exacted a heavy price in terms of ill effects on health. The consumption of cooked soft foods led to poor dental health (increase in dental caries, and antemortem tooth loss, periodontal disease with resorption of alveolar tissue, dental enamel defects, malocclusion), a decline in nutritional quality as a narrower range of foods was consumed, reduced rates of growth in children whose shorter stature and loss of cortical bone thickness are the consequences of nutritional deficiencies, modifications of histological structures in bones that may reflect overproduction of parathyroid hormone resulting from low calcium and high phosphorus ratios, higher rates of traumatic stress with more frequent cranial injuries, infectious diseases spread by poor sanitation and high density living conditions in permanent settlements, and even changes in facial architecture and size due to craniofacial and dental responses to dietary adaptations and muscular-skeletal modifications of the entire masticatory apparatus.

Although early food producers of South Asia do not exhibit all these physical changes, reduction of muscular-skeletal robusticity of cranial and postcranial bones is clearly seen.

Chapters 14 and 15 are devoted to the Harappan Civilization and its heritage. Chapter 14 gives a brief history of the discovery of the Civilization, excavation of its important sites, and chief characteristics and achievements. However, the thrust of the chapter is on the human skeletal material from the sites of Mohenjodaro, Cemetery R-37 at Harappa, Kalibangan, Chanhudaro, Allahdino, Lothal, Rupar and Rojdi. The chapter gives a brief description of the various modes of disposal of the dead encountered at these sites. The largest skeletal sample, numbering over 100 specimens, comes from Mohenjodaro. The skeletal series have been examined by a number of biological anthropologists like B.S. Guha, B.K. Chatterjee, G.D. Kumar, S.S. Sarkar, P.C. Dutta, K.A.R. Kennedy, John R. Lukacs, and the students of the last two scholars like B.E. Hemphill, N.C. Lovell and others.

The morphometric analysis of the skeletal data shows that the Harappans did not constitute a homogeneous genetic population. Sarkar found close affinities of the Lothal population with the people of Tepe Sialk, Al' Ubaid and Kish in West Asia. The affinities of the Cemetery R-37 people are seen with those of post-Harappan Cemetery H, Iron Age people of Timargara and Tepe Hissar III rather than with the people living south of the Indus system. The author notes that two demographic discontinuities are seen in the northwestern sector of the subcontinent, the first between 6000 and 4500 B.C. and the second after 800 B.C. After 2000 B.C. no new phenotypic pattern is seen. It is interesting to note that a significant biological separation is seen between the Neolithic and Chalcolithic periods at Mehrgarh while the period between 4500 and 1750 B.C. shows stable continuity. Further, Mohenjodaro population differs from the other Harappan populations. Increased incidence of infectious diseases and anemias is also seen.

Contemporaneously with, and following the decline of, the Harappan Civilization in the early second millennium B.C. and its eventual disappearance in the succeeding centuries, a number of regional rural cultures appeared in different parts of the subcontinent. These are discussed in chapter 15. Among them are the Copper Hoard and OCP culture of the Indo-Gangetic Divide and the Yamuna-Ganga doab; Neolithic-Chalcolithic cultures of the middle and lower Ganga valley represented at a large number of excavated sites like Sohagaura, Imlidih, Khairadih and Narhan in eastern Uttar Pradesh, Chirand, Senuwar and Sonpur in Bihar, and Pandu Rajar Dhibi, Mahisdal and Mangalkot in West Bengal; Ahar culture of Mewar in Rajasthan; Kayatha, Ahar and Malwa cultures of Malwa or western Madhya Pradesh; and the Malwa and Jorwe cultures of western Maharashtra. The Ahar culture is known from over 100 sites in the valleys of the Banas river and its tributaries, four of which, namely Ahar, Gilund, Balathal and Ojhiyana have been excavated. Surprisingly, the site of Balathal, excavated for seven seasons since

1994, is not mentioned even though the findings were published in *Man and Environment* and *South Asian Studies* as early as 1995 and 1997. The Chalcolithic cultures of Malwa are known from the excavated sites of Navdatoli, Nagda, Kayatha, Dhangwada and Eran, and those of western Maharashtra from the sites of Prakash, Savalda, Bahurupa, Kaothe, Bahal, and Tekwada in the Tapi valley, Nevasa, Jorwe, Daimabad, and Apegaon in the Godavari valley, and Chandoli, Inamgaon, Walki, and Songaon in the Bhima valley. The Chalcolithic cultures of Western Maharashtra share some of the traits like ground stone axes and burials beneath the house floors with the Neolithic culture of the neighbouring region of Karnataka, Andhra and Tamil Nadu. A large number of human skeletons have been found in the burials from western Maharashtra sites, the largest sample, comprising 176 skeletons, coming from Inamgaon. Unfortunately, adults and adolescents are poorly represented in this sample, most of the skeletons belonging to infants and children.

S.R. Walimbe and A. Tavaras have noted a number of pathological markers in the sample. These include porotic hyperostosis and certain bone lesions found in immature individuals that may be ascribed to cranial yaws, trigonocephaly, and hereditary haemolytic anaemia, infantile scurvy, skeletal lesions possibly related to iron deficiency, *osteophytosis,* and spina bifida occulta, cranial thickening, vertebral lipping, unusual conditions of myostitis ossificans circumscripta, *auditory exostosis,* cribra orbitalia, and dental pathologies. Tooth size reduction, already noted in other early agricultural populations, is noticed in Maharashtra sites as well. The life expectancy of the Chalcolithic populations, despite assured food supply, was low. The old age was 35 years and no skeleton has an age estimate beyond 40 years.

Chapter 16 deals with the early Iron Age cultures, the most important of which are the Megalithic, Gandhara Grave Culture (GGC), and Painted Grey Ware (PGW). It gives a list of the types of megalithic monuments and their brief definitions, and history of megalithic research starting with the first description and excavation of megalithic monuments by J. Babington in Kerala in 1820. The most important early contribution to this field was made by Colonel Phillip Meadows Taylor, a man of limited formal education but an extraordinarily enlightened and humane administrator and a versatile person with interests in diverse fields, including engineering, archaeology and literature. Taylor provided the first anatomical description of the human skeletons recovered from his excavation of underground cists at Jewurgi in the Shorapur region of the present-day Karnataka State, and brought Indian megaliths to the notice of British and European archaeologists through his lectures and publications. Among the other pioneering contributors to this field were Bishop Robert Caldwell, author of the first grammar of Dravidian languages, Major George Godfrey Pearce, A.C.L. Carlleyle, J.M. Fergusson, B.R. Branfill, and Alexander Rea. Rea excavated the large urn cemetery at Adittanalur near Madras at the beginning of the twentieth century. His excavations produced a large number of human skeletons as well as iron implements and bronze objects. Fergusson was the first scholar to suggest an association between the megalithic people and the living tribal communities of south India.

In the second half of the twentieth century significant contribution to megalithic research has been made by a number of archaeologists like B.K. Thapar, N.R. Banerjee, R. Subrahmanyam, S.B. Deo, A. Sundara, B.K. Gururaja Rao, and K. Rajan. Deo's excavations of stone circles at a number of sites in the Vidarbha region of Maharashtra have provided evidence, among other things, of the sacrifice of horse and its burial along with its owner, and iron smelting, the latter at Naikund.

Excavations of megalithic burials in south India and Vidarbha have yielded a large quantity of human skeletons. These have been studied by a number of biological anthropologists like Edgar Thurston, Solly Zuckerman, B.K. Chatterjee, P. Gupta, S.S. Sarkar, K.A.R. Kennedy, and J.R. Lukacs. Sarkar was of the opinion that at Brahmagiri brachycephalic megalithic people, whose biological affinities lay with the Bronze Age people of West and Central Asia, had replaced the dolichocephalic Neolithic people who belonged to the Australoid stock. On the basis of his study of skeletons from Brahmagiri and Maski he concluded that mesobrachycranic individuals made up the majority of the population at these sites, and that these people were typical of other megalith builders. To test this hypothesis of homogeneity of phenotypic pattern of South Asia's Iron Age people, Kennedy carried out an analysis of the skeletal series from Adittanalur, Maski, Brahmagiri and Raigir. The study of six adult crania from Raigir revealed that the cranial form, ranging from hyperdolichocrany to hyperbrachycrany, showed that phenotypic diversity rather than homogeneity characterized the megalithic builders at this site. Raigir skeletons also showed a number of pathological markers like cribra orbitalia, *porotic hyperostosis,* osteoarthritic lipping of the vertebral bodies, a case of pseudo-spina bifida, and dental enamel hypoplasia and caries. The small size of Raigir teeth falls within the ranges of reduced tooth size found among long term agriculturists and pastoralists in South Asia. What is more important is that "All of the Raigir specimens show low musculuar-skeletal robusticity and reduction of sexual diamorphism, features not associated with the occasionally encountered robust cranial and postcranial features of those Iron Age skeletons once assigned to an Australoid racial type".

Kennedy carried out a multivariate analysis involving Euclidean distance and centroid cluster analysis on the combined morphometric data from Brahmagiri, Ruamgarh, Ranchi, Nagarjunakonda and Adittanalur to clarify the question of biological homogeneity of India's Iron Age populations. This analysis supported the findings of the author's earlier bivariate, multivariable comparative study of skeletal series from 12 megalihic sites, namely that variability of phenotypic characters was a characteristic feature of the sample. It also did not support Wheeler's thesis of a catastrophic invasion of a foreign people into the southern Deccan with the introduction of iron technology. Instead, it showed a biological contiuum of Neolithic-Chalcolithic populations with iron-using populations. Other sites from which human skeletal material has been examined are Tadakanahalli and Komaranahalli in Karnataka, and several sites in the Vidarbha region of Maharashtra. The age distribution of 28 specimens recovered from Mahurjhari in Vidarbha is 10 to 32 years. Females appear to have died at slightly earlier ages (16 to 22 years) than males (22 to 32 years). J.R. Lukacs' study of Mahurjhari dentition showed moderate incidence of dental caries and stress-related dental diseases to indicate a diet high in carbohydrates. Lukacs suggested that his dental caries rate of 7.7 percent in his sample of 196 specimens means that the Iron Age people of Mahurjhari were committed agriculturists. Interestingly, the Mahurjhari molar teeth are the largest of any Iron Age series from the subcontinent, a feature that might be an indicator of a relatively brief lapse of time between the hunting-foraging economy of Mahurjhari forebears and the Iron Age population represented in the burials.

The GGC culture, so named by A.H. Dani, is known from the excavations of a number of burial sites like Butkara II, Katalai I, Loebanr I, Timargara, and Sarai Khola in the valleys of Swat, Chitral, Buner and Gorband in Pakistan. These excavations have yielded cremation and inhumation burials in subterranean tombs divided into two or three chambers, one on top of the other, and accompanied by grave goods comprising objects of copper, bronze and iron. There are regional variations in burial practices ranging from cremation to single or multiple interments in subterranean tombs, flexed and supinely extended positions of skeletons, heads directed to any of the cardinal directions, and different quantities and qualities of funerary goods. This lack of uniformity suggests occupation of Gandharan sites by societies with different cultural practices and at separate periods of time or of changing funerary sites within a society. Even though GGC people knew the use of bronze, and later iron, their economy and social organization were not much different from those of their Neolithic predecessors.

The authors of the GGC culture have been identified with the Aryans and several other peoples coming from eastern Europe or central Asia. The human skeletons from the Gandharan graves have been studied by several Italian, German and American biological anthropologists. The large sample from Timargara was analysed by Wolfram Bernhard who described the people represented by them as hyperdolichocranic, high vaulted, narrow nosed, and with comparatively broad and flat faces, and the estimated stature range as 163-82 cm for males and 148-67 cm for females. He assigned the physical configuration to the phenotypic pattern of Mediterranean peoples. The Timargara population is not a homogeneous entity since six centuries separate some of the burials as indicated by the range of radiocarbon dates from 3380 B.C. to 2805 B.C. from the site. Crania not conforming to a Mediterranean phenotypic pattern were identified as closer to morphometric variables of eastern Europeans, eastern Asians, and the Veddids. Bernhard explained this degree of physical heterogeneity within a single cemetery as the consequence of multiple migrations of people from Iran and central Asia. He described the skeletons from Period III of Sarai Khola, believed to belong to GGC, as a moderate-statured, brachycranic, low-vaulted population with comparatively broad and somewhat prognathic faces with a narrow and prominent nasal form, "giving to skulls a Europoid appearance".

The PGW culture, named after its distinctive grey-coloured ceramic, made from well-levigated clay, baked at a high temperature, and painted with geometric motifs in black, is known from over 400 sites in the Indo-Gangetic Divide and the upper Yamuna-Ganga doab. The PGW people cultivated rice and other crops, used domesticated horse, knew the use of iron from the very beginning, and lived in houses made of wattle-and-daub and sun-baked bricks. The culture is dated by a number of radiocarbon dated to ca. 1000-600 B.C. and its later phase overlaps with the NBP culture of the Early Historic period. It has been found at a number of sites which figure prominently in the story of the *Mahabharata* epic, and its identification with the later Vedic people is a certainty.

Chapter 17 deals with the history of racial classifications of the South Asian population, starting with H.H. Risley's classification proposed as early as 1886. Risley recognized seven racial types on the basis of an anthropometric study of 5,784 individuals. The classifications proposed by several anthropologists are a variation and elaboration of the three races, namely proto-Australoid, Mediterranean, and the Armenoid branch of the Alpine race. The author has given the classifications proposed by Egon Freiherr von Eickstedt, S.C. Roy, S.S. Sarkar, and R. Biasutti. He has discussed in detail the decline and fall of the race concept, the credit for which goes largely to Dilip Kumar Sen who succeeded the eminent anthropologist, Dhirendra Nath Majumdar, at Lucknow University. Sen rejected the existing classifications as outmoded and erroneous and based on obsolete methodology, and argued that populations are real while races are abstractions. He introduced population genetics, which was already being extensively used by western anthropologists, in the biological study of the Indian people.

The later part of the chapter is devoted to the attempts of linguists, archaeologists and historians to explain the presence of languages belonging to the Indo-European family in north India, and to identify the Aryans, who introduced these languages into South Asia, in the archaeological record. The author has referred to Aryan invasion several times. However, almost all archaeologists and historians – both native and foreign – have rejected the theory of invasion, and, barring those motivated by national pride, all others accept migrations of horse-riding peoples from the grasslands of central Asia over a period of many centuries. It is also agreed that these migrations must have taken place long before the *Rigveda*, the oldest literary document of the Indo-Europeans, was composed on the Indian soil, for there is not even a remote hint in the *Rigveda* of the composers of the hymns coming from outside.

The cultures proposed as belonging to the Aryans are Cemetery H at Harappa, Jhukar, Copper Hoards, OCP, Kurgan culture of the Russian steppes, Ahar or Banas culture of Mewar or southeast Rajasthan, GGC, and PGW. In recent years several archaeologists and historians have equated the Harappan Civilization with the *Rigvedic* culture on the ground that the material remains of the Harappan Civilization correspond closely with the culture of the Aryans depicted in the *Rigveda* (Bhagwan Singh 1995; Gupta 1996; Lal 2002). Whether or not one agrees with this extreme view, there is no denying the fact the sacred river Sarasvati was central to both the Harappan Civilization and the *Rigvedic* people. The vast majority of the Harappan sites are located on this river, now represented by the dried-up course of the Ghaggar-Hakra in India and Pakistan, and it is hailed as the most sacred river in many hymns of the *Rigveda.* It is thus very clear that the Harapans and the *Rigvedic* people, sharing the same geography, must have come into close contact with each other. This is best demonstrated by the persistence of many Harappan traits in the present-day Indian society which have been copiously documented by B.B. Lal in his recent book (Lal 2002).

This closeness of the Harappan Civilization and the *Rigvedic* and later Indian culture has been noted by foreign archaeologists as well. The author himself has quoted (P. 367) Bridget and Raymond Allchin's statement that "it is necessary to admit that not only the end of the (Harappan) cities, but even their initial impetus may have been due to Indo-European speaking peoples". The late George F. Dales (1977) had drawn similar parallels between Harappan objects and items of Pakistani life. Excavators of Harappan sites like Sir John Marshall, M.S. Vats, E.J.H. Mackay, Sir Mortimer Wheeler (1953: 103-104), B.B. Lal (1997: 257-80) and J.M. Kenoyer (1998: 173-83), to name but a few, have been pointing out survival of Harappan elements into later Indian culture, particularly Hinduism and its associated metaphysics, in their reports of excavated sites. These include worship of proto-Shiva in the form of *Pashupati* or Lord of the Beasts and phallus, animals, particularly bull or *Nandi,* mother goddess, and *pipal* tree. The late M.E.L. Mallowan (1955: 199-202), in his review of Sir Mortimer Wheeler's *The Indus Civilization,* had also pointed out the continuity of the Harappan system of weights and measures up to recent times.

Finally, chapter 18 provides a brief summary of the book and the main approaches adopted in the study of South Asian palaeoanthropology.

Among other things, the book also provides information about the histories of the departments of archaeology and anthropology in South Asian countries, with the names and life spans of their founders, professional organizations like Societies and Associations of archaeology and anthropology and related subjects like statistics and museology, and major journals along with the dates of their establishment.

The text is supplemented with 50 illustrations, including 11 maps of the sites of various cultural periods. The illustrations include sketches of seven archaeologists, anthropologists, Indologists and palaeontologists comprising Robert Bruce Foote, Sir William Jones, Johann Friedrich Blumenbach, D.N. Majumdar, B.S. Guha, S.S. Sarkar, E.F. Eickstedt as also of Fort William and Asiatic Society's building at Calcutta. A number of other archaeologists and anthropologists like Sir Alexander Cunningham, Sir John Marshall, M.S. Vats, E.J.H. Mackay, Sir Mortimer Wheeler, H.D. Sankalia, Verrier Elwin, C. von Fuerer Haimendorf, A. Aiyappan, Irawati Karve, L.K.A. Iyer, P.E.P. Deraniyagala, H. de Terra, H.L. Movius, and Hugh Falconer could have been included.

To make the book intelligible to non-specialists the author has given in parentheses common English words for technical terms like pongid, hominid, prognathism, diastemata and *caries sicca.* The book is marked by thoroughness, meticulousness, compactness, and natural flow and lucidity of style.

It would indeed be most surprising if a book of this size, depth and complexity did not have a few minor typographic and factual mistakes. Even though the few mistakes, that are there, in no way detract from the high quality of the book, they are being listed below so that they can be corrected in the next edition, which will no doubt be required soon, to ensure the otherwise flawless quality of the book.

P. 12. India Prehistory for Indian Prehistory; P. 14. Ssisatic for Asiatic; P. 19. Palavaram for Pallavaram; P. 91.

Jelum for Jhelum in the map; P. 96. Trimurthy for Trimurti; P. 97. Dharanidar for Dharanidhar; P. 103. Chopa for Chopra; P. 104. used for use;.P. 192. map, Runigunta for Renigunta and Jalahali for Jalahalli; P. 200. hunter-gathers for hunter-gatherers; P. 201. Singurli for Singrauli; P. 217. Birphanpur for Birbhanpur; PP. 208-09, Mahasana and Mahasena for Mehsana; P. 250. *Bubulus bubulus* for *Bubalus bubalis*; P. 248. Ghaghra for Ghaggar; P. 249. map, Najarjunakonde for Nagarjunakonda; P. 250. Kunjhum for Kunjhun; P. 256. Pirek for Pirak; P. 257. sheep (*Cervus duvauceli*), *Cervus duvauceli* is barasingha deer, Sheep is *Ovis aries*; P. 260. contracts for contacts; P. 264. sambhur for sambar; P. 264. *Bos bubulus* for *Bos bubalis*; P. 265. Shind for Shinde; PP. 265 and 378. Maharashtran for Maharashtrian; P. 266. *coracona* for *coracana*, *Penistune* for *Pennisetum*, Gallur for Hallur, wild cattle species for domestic cattle; P. 267, Devi for Deva, Nagarahan for Nagarajan; P. 271. Majumdar for Mujumdar; PP. 122, 193, 285 and several other pages, latter for later; P. 287. agricultural for agriculture; P. 296. *spaerococcum* for *sphaerococcum*, sassamum for sesame; P. 329. map, Atransikera for Atranjikhera; P. 338, cremains for cremations; P. 339, Mughul for Mughal; P. 349, Shimoda for Shimoga; P. 350, Bhamimohari for Bhagimohari; P. 352, Jankhedhar for Jamkhedkar; P. 361. Subrahmanyan for Subrahmanyam; P. 366, Bhagavat Simnaji for Bhagavat Sin-mhaji; P. 369. Arandhati for Arundhati; P. 371. Chakrabharti for Chakrabarti; P. 373. Igni for Agni and Constantini for Costantini; P. 474. Jainta hills for Jaintia hills; P. 396, Clarke G. for Clark, G.

P. 2. Sikkim is not an independent country but one of the states of the Indian Union; P. 4. Garhjat hills are unheard of and are not shown in the map on P. 3; The Eastern Ghats are not only in Orissa but extend into Andhra Pradesh as well; P. 9. There are no basaltic rocks around Hyderabad. The rocks there are all granitic. In fact, basaltic rocks don't start from Pune but extend all the way to Saurashtra and Malwa; P. 221. The claim that sorghum grains were found in the Mesolithic deposits in Sri Lanka cannot be true because sorghum is an African crop, and it was introduced into South Asia only around 2000 B.C.; P. 340, There are no PGW sites in Bihar nor are Chirand and Rajghat PGW sites. In fact, PGW is totally absent east of Allahabad; P. 350. Vidarbha region is in eastern and not in western Maharashtra.

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Note: Details of the publications cited in the review, which are already available in the References in Kennedy's book, are not considered necessary to be repeated here.

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Report of the General Secretary for 2001-2002 (01-04-2001 to 31-03-2002)

The functioning of the Society during the year ending on 31-3-2002 has been quite satisfactory, both academically and financially. The regular activities of the Society were carried out successfully. The financial position is reasonably sound because of the interest accruing on the fixed deposits and annual grants from the Archaeological Survey of India for the publication of the Society's Journal *Man and Environment* and from the Indian Council of Historical Research for the publication of the Journal as well as for organizing the annual conference. We are grateful to these organizations for their financial support. An Audited Statement of the Accounts of the Society for the year is appearing in this issue of the Journal.

Man and Environment

This is the twenty-seventh year of the publication of the Journal and fifteenth year of its biannual publication. The last two issues of the journal were slightly delayed because of technical problems. However, by XXVII (2) issue, which will appear in December, 2002, we will have attained punctuality. The Journal has maintained its standard and continues to attract a wide range of manuscripts by scholars from within and outside the country. The circulation of the Journal is steadily increasing.

We sincerely thank Mr. Sujit Patwardhan and his staff at Mudra Press for their excellent cooperation in the production of the Journal.

ISPQS Monograph Series 2

The Society is also engaged in the publication of monographs. This year it was able to bring out its second monograph, *The Biological Anthropology of Human Skeletal Remains from Bhimbetka, Central India*, edited by K.A.R. Kennedy, J.R. Lukacs and V.N. Misra. The Society has decided to give this monograph at a discounted price of Rs. 100/- (Paperback original price Rs. 190/-) to its members. The Society will publish its third monograph, Prehistoric Contacts between South Asia and Africa: The Dispersal of Plant Cultivars along the North India Sea Board, edited by V.N. Misra and M.D. Kajale before the end of the year. This monograph too will be available to the Society's members at discounted price.

Annual Conference

The XXIX Annual Conference was held, in conjunction with the XXXV Annual Conference of the Indian Archaeological Society, XXV Annual Conference of the Indian History and Culture Society, and the seminar on Ancient Technology at the Department of Ancient Indian History and Archaeology, Maharaja Sayajirao University of Baroda, Vadodara, Gujarat on 22 to 24 November, 2001.

The following life members of the Society participated in the conference:

D.P. Agrawal, R.C. Agrawal, P. Ajithprasad, Shahida Ansari, K. Bhan, Banani Bhattacharya, R.S. Bisht, Subrato Chakrabarti, P.P. Dandwate, B.C. Deotare, P. Binodini Devi, K.N. Dikshit, Kiran Dimri, H.N. Dutta, Sanjay Eksambekar, Rohita Eswar, Y.S. Farswan, Savita N. Ghate, V.D. Gogte, M.C. Gupta, Sunil Gupta, S.P. Gupta, Rajaram Hegde, P. P. Joglekar, Praveen Joshi, P.S. Joshi, M.D. Kajale, B.M. Khanduri, K. Krishnan, Ravi Korisettar, Giriraj Kumar, B.B. Lal, Sheila Mishra, V.D. Misra, V.N. Misra, R.K. Mohanty, P. Arati Deshpande-Mukherjee, Malti Nagar, Jagat Narayan, J.N. Pal, Ramesh Kumar Pancholi, Arakhita Pradhan, Vijaya Prakash, K. Thimma Reddy, P.M. Saklani, R.K. Sharma, K.S. Shukla, Manoj Kumar Singh, Vijay Singh, Ajoy Kumar Sinha, V.H. Sonawane, Devi Prasad Tewari, Capt. R.S. Thakur, P.K. Thomas, D.N. Tripathi, Sila Tripati, Vibha Tripathi, T.P. Verma and S.R. Walimbe.

Inaugural Function

The inauguration of the joint Annual Conference of the Indian Archaeological Society, Indian Society for Prehistoric and Quaternary Studies and Indian History and Culture Society was held at 10 am, on 22 November, 2002 at the Prof. Chandravadan Mehta Auditorium of the M.S. University of Baroda. Dr. Mrunalini Devi Puar, Honorable Chancellor of the Maharaja Sayajirao University of Baroda, inaugurated the Conference. Prof. V.D. Pathak, Pro-Vice Chancellor of the M.S. University presided over the function. Ms. Kasturi Gupta Menon, Director General, Archaeological Survey of India was the Guest of Honor.

Presidential Address

The Presidential Address of the Society was delivered by Prof. K. Thimma Reddy on *Archaeology of the Eastern Ghats: An Ecological Overview*, **which** has been published in XXVI (2) issue of Man *and Environment.*

Professor H.D. Sankalia Memorial Lecture

The Eleventh Professor H.D. Sankalia Memorial Lecture was delivered by Prof. M.K. Dhavalikar on *Green Imperialism: Monsoon in Antiquity and Human Response*, which has been published in XXVI (2) issue of Man *and Environment.*

Professor H.D. Sankalia Young Archaeologist Award

The following five papers were presented for this Award:

1. Mannoj Kumar Singh: The Explanation of Culture Change: A New Model for Indian Prehistory, 2. Sukanya Sharma: Geomorphological Background of the Stone Age Cultures of the Ganol and Rongram Valleys in Garo Hills, Meghalaya, 3. Kalini P. Khandwalla: The Evolution of Early Historic Settlement Types and Material Culture in Gujarat, 4. Anant N. Joshi: Head Dresses and Head Ornaments in Indus Civilization, and 5. Shahida Ansari: Ethnoarchaeology of Prehistoric Settlement Pattern of South-Central Ganga Valley.

These papers were sent to three eminent experts for their evaluation. After presentation at the Conference, the panel of judges nominated by the Society Executive Committee, namely Professors B.B. Lal, V.D. Misra and Purushottam Singh unanimously recommended the papers by Kalini P. Khandwalla and Shahida Ansari for the Professor H.D. Sankalia Young Archaeologist Award.

Dr. Malti Nagar Ethnoarchaeology Award

Mr. Alok Kumar Kanungo from the Deccan College, Pune was the only candidate for Dr. Malti Nagar Ethnoarchaeology Award. The following three published research papers were submitted by him for this Award: (1) Bondo Costume Ornaments, *Ornament* 23(4), Summer 2000, pp. 20-21, San Marcos, California, (2) Palm Leaf Bead, *Bead Forum* (October 2000 issue) pp. 9-15. Russellville, Arkansas, USA, (3) Beads of Juangs. *Bead: Journal of Society of Bead Researchers*, Vol. VIII & IX, 2001(1996-97 issue) pp. 3-10. Ottawa, Ontario, Canada. The referees nominated by the Society unanimously selected his papers for the Dr. Malti Nagar Ethnoarchaeology Award.

Professor R.K. Sharma Award for Excellency in Archaeology

In recognition of the valuable contribution made by Shri Krishna Devaji to Indian Archaeology, particularly, in the fields of art and architecture over a period spanning more than sixty years, the Indian Society for Prehistoric and Quaternary Studies gave the first Professor R.K. Sharma Award to him, posthumously. The Award was to be received by Krishna Devaji's daugheter, Archana. But unfortunately she was unable to come to Vadodara and so the Award was received by Dr. S.P. Gupta on Krishna Devaji's behalf.

The academic sessions of the conference were held from the afternoon of 22 to 24 November and following papers were presented at the Conference:

R.K. Ganjoo and M.N. Koul: Quaternary Glacial Evidences from Western Himalaya, Himachal Pradesh.

P. Rajendran: Geo-archaeological Studies at the Bommayarpalayam, Villupuram district, Tamil Nadu.

Shanti Pappu, Y. Gunnell, M. Taieb, J-P Brugal & R. Sukumar: Excavation at the Palaeolithic site of Attirampakkam: The Animal Foot Print Surface.

Sushma G. Deo, S. Mishra, S. Naik and S. N. Rajaguru: Geoarchaeology of Acheulian Sites in the Nimar Region, Madhya Pradesh.

B.C. Deotare, M.D. Kajale and S.N. Rajaguru: On Recent Geomorphic and Archaeological Observations around Sambhar Lake, District Jaipur.

Subrato Chakrabarti and Banani Bhattacharyya: Further Research in the Mesolithic Archaeology of North East Bankura, West Bengal.

Giriraj Kumar: Domestication of Cattle in India Started with Humpless Cattle in Mesolithic Age.

V.N. Misra and R.K. Mohanty: Further Excavations at Balathal, Rajasthan (1999-2000).

Vasant Shinde and G.L. Possehl: Excavations at Gilund, Rajasthan.

D.N. Tripathi: Indian and Western Asian Cultural Contacts.

Arati Deshpande-Mukherjee and Jitu Mishra: Subsistence during the Historic period on the Orissa Coast.

Sudhir Nautyal, Vinod Nautyal and Mohan N.: Auto-Cad Application in Archaeology.

Vinod Nautyal and Sanjay Juyal: Stable Isotope Analysis of Bone Remains From Garhwal Himalaya: Preliminary Results.

B.C. Deotare, Gurudas Shete and S.N. Rajaguru: Explorations in Purna Basin of Vidarbha Region, Maharashtra.

Vishwas D. Gogte: Discovery of the Ancient Port at Palshet: The Palaepatmai of the *Periplus of the Erytharean Sea.*

Pramod P. Joglekar, Arati Deshpande-Mukherjee, S.G. Deo and S. Ghate: A Preliminary Archaeological Investigation at Kelshi, District Ratnagiri, Maharashtra.

P.S. Joshi, K. Ismail and S.R. Walimbe: Recent Explorations in the Vidarbha Megalithic Region.

R.K. Mohanty: Major G.G. Pearse's Megalithic Excavation at Wurreegaon in 1867: The Earliest Archaeological Excavation in Maharashtra.

S.K. Aruni: Military Architecture of Nolambavadi, South India.

Vilas D. Jhadhav: A Copper Plate Inscription from Dhank, Gujarat.

New Life Members

The following persons joined the family of life members of the Society during 2001-2002:

Dinesh Bhargava, Banani Bhattacharya, Michael Danino, Nupur Dasgupta, Naresh Gupta, Alok Kumar Kanungo, Prabhakar C. Khole, Anant Joshi, K. Madhavi, Mitashri Mitra, Sanjay Modi, Vinod Nautiyal, Madhulika Samanta, P.B.S. Sengar and V. Thanzaw

Meeting of the Executive Committee

Minutes of the Meeting of the Executive Committee

A meeting of the Executive Committee of the Society was held in the Department of Ancient History and Archaeology, M.S. University of Baroda, Vadodara, on Saturday the 24th November, 2001. The meeting was presided over by Prof. V.D. Misra. The following members were present.

1. Prof. V.D. Misra (in chair), 2. Prof. V. N. Misra, 3. Dr. P. K. Thomas, 4. Dr. P.P. Joglekar, 5. Dr. P. S. Joshi, 6. Dr. Arati Deshpande-Mukherjee, 7. Dr. Sheila Mishra, 8. Dr. B.C. Deotare, 9. Dr. Savita Ghate, 10. Dr. K. Krishnan, 11. Dr. R.K. Mohanty, 12. Dr. Malti Nagar.

Dr. R.D. Chaudhury, Dr. P.V. Pathak, Dr. S.F. Wadia, Dr. B.L. Nagarch, Dr. K.P. Rao, Dr. J.N. Pandey, and Dr. Vijay Sathe were unable to attend the meeting.

At the outset, the General Secretary, Prof. V.N. Misra, welcomed the members. He apprised the Committee about the major activities of the Society during 2000-2001. These include details of the 28th Annual Conference held at the National Museum, New Delhi on 1-3 December 2000, and publication of Vol. XXVI (1) of *Man and Environment*. He also apprised the Committee of the details of the audited statement of Society's income and expenditure during 2000-2001, which is printed in *Man and Environment* XXVI(1). The Society's financial situation remains reasonably good.

Meeting ended with a vote of thanks to the Chair.

Meeting of the General Body of the Society

The General Body meeting of the Society was held at the Department of Ancient History and Archaeology, M.S. University of Baroda, Vadodara on 24th November, 2001.

The following members were present.

D.P. Agrawal, R.C. Agrawal, P. Ajithprasad, Shahida Ansari, K. Bhan, Banani Bhattacharya, R.S. Bisht, Subrato Chakrabarti, P.P. Dandwate, B.C. Deotare, P. Binodini Devi, K.N. Dikshit, Kiran Dimri, H.N. Dutta, Sanjay Eksambekar, Rohita Eswar, Y.S. Farswan, Savita N. Ghate, V.D. Gogte, M.C. Gupta, Sunil Gupta, S.P. Gupta, Rajaram Hegde, P. P. Joglekar, Praveen Joshi, P.S. Joshi, M.D. Kajale, B.M. Khanduri, K. Krishnan, Ravi Korisettar, Girraj Kumar, B.B. Lal, Sheila Mishra, V.D. Misra, V.N. Misra, R.K. Mohanty, P. Arati Deshpande-Mukherjee, Malti Nagar, Jagat Narayan, J.N. Pal, Ramesh Kumar Pancholi, Arakhita Pradhan, Vijaya Prakash, K. Thimma Reddy, P.M. Saklani, R.K. Sharma, K.S. Shukla, Manoj Kumar Singh, Vijay Singh, Ajoy Kumar Sinha, V.H. Sonawane, Devi Prasad Tewari, Capt. R.S. Thakur, P.K. Thomas, D.N. Tripathi, Sila Tripati, Vibha Tripathi, T.P. Verma and S.R. Walimbe.

The meeting was presided over by Prof. V.D. Misra, Chairman of the Society.

The following business was transacted at the meeting.

The report of the activities of the Society for the year 2000-2001 was presented by Prof. V.N. Misra, General Secretary of the Society. It was unanimously approved by the members of the Society.

The Annual Audited Statement of the Accounts for the year 2000-2001 was placed before the General Body by the General Secretary, and it was unanimously approved by the members present.

President of the Society for 2002

Prof. V.N. Misra proposed the name of Prof. Purushottam Singh, Department of Ancient Indian History, Culture and Archaeology, Banaras Hindu University, Varanasi as President of the Society for the next year. The proposal was unanimously accepted by the members present.

Professor H.D. Sankalia Memorial Lecturer

Prof. V.N. Misra proposed the name of Shri M.C. Joshi, a former Director General of the Archaeological Survey of India and a former Member Secretary of the Indira Gandhi National Centre for the Arts, for the Prof. H.D. Sankalia Memorial Lecturer for 2002. The proposal was unanimously approved by the members present.

Election to the Executive Committee

As the term of the previous Executive Committee was coming to an end by 31st March 2002, the members present during the General Body Meeting elected the following Life Members of the Society to the Executive Committee for a term of three years i.e. from 01-04-2002 to 31-03-2004.

Chairman	Prof. V.N. Misra
Vice Chairman	Dr. R. C. Agrawal
General Secretary	Dr. P. K. Thomas
Joint Secretary	Dr. P. P. Joglekar
Assistant Secretary	Dr. P. S. Joshi
Treasurer	Dr. Arati Deshpande-Mukherjee

Executive Committee Members

Dr. S.G. Deo, Dr. B.C. Deotare, Dr. P.P. Joglekar, Dr. K. Krishnan, Dr. Malti Nagar, Dr. R.K. Mohanty, Dr. K. Rajan, Dr. Sadashiba Pradhan, Dr. K.S. Saraswat, Dr. Sheila Mishra, Dr. Sila Tripati, Dr. R.N. Singh, Dr. Sunil Gupta, Dr. S.F. Wadia

The General Body appreciated the contribution of the outgoing Executive Committee of the Society to the Society's functioning during the year 2001-2002.

The meeting ended with a vote of thanks to the Chair.

20-11-2002

(V.N. Misra)
General Secretary

INDIAN SOCIETY FOR PREHISTORIC AND QUATERNARY STUDIES

c/o Department of Archaeology, Deccan College, Pune 411 006

BALANCE SHEET AS ON 31st MARCH 2002

Funds and Liabilities	Rs.	Rs.	Properties and Assets	Rs.	Rs.
Trust Funds or corpus Bal. as per prev. B/S	672,043.40		Immovable Properties (as per Schedule)		
Ajustment during the year			Bal. as per prev. B/S	00.00	
(Donations recd during the year)	00.00	672,043.40	Add: During the year	00.00	
			Less: Sold during the year	00.00	
Other Earmarked Funds—	83,607.95		Less: Depreciation @ 5%	00.00	00.00
(Created under the provisions of the trust deed or scheme or out of the income)			Investments (As per Schedule II)		1,564,749.40
Depreciation fund	00.00				
Sinking fund	00.00		Other Movable Properties (As per Schedule III)		77,700.83
Reserve fund	777,807.99	861,415.94			
			Bal. as per prev. B/S.		
Loans (Secured/Unsecured)			Add: During the year	00.00	
(As per schedule)			Less: Sold during the year	00.00	
For expenses	11,232.50		Less: Depreciation @ 5%	00.00	
For Advance	00.00	11,232.50	Loans (Secured and Unsecured)	00.00	
			Loans Scholarships	00.00	
For rent and other deposits	00.00		Other Loans	00.00	
Audit fee	2,200.00		Cash & Bank balance	00.00	00.00
Provision for Contribution	788.94	14,221.44			
Income & Expenditure A/c.			Income Outstanding		
Bal. as per prev B/S	00.00		Rent, Interest, Other Income	00.00	
Less: Appropriation if any	00.00		Cash	1,354.50	
Add: Surplus of Inc& Exp A/c.	238,227.46	238,227.46	Bank Balances	141,441.97	
			Amounts Receivable	661.54	143,458.01
			Income & Expenditure A/c.		
			Bal. as per prev. B/S	00.00	
			Add: Deficit for the year	00.00	00.00
Total Rs.		1,785,908.24	Toral Rs.		1,785,908.24

As our report of even date

FOR A.S. CHANDVANKER & CO., CHARTERED ACCOUNTANTS

Date: 11.09.2002
Place: PUNE

A.S. CHANDVANKER

(P.K. Thomas)
GENERAL SECRETARY

(P.P. Joglekar)
JOINT SECRETARY

(Arti Deshpande-Mukherjee)
TREASURER

INDIAN SOCIETY FOR PREHISTORIC AND QUATERNARY STUDIES,

c/o Department of Archaeology, Deccan College, Pune.

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31st MARCH 2002.

Expenditure	**Rs.**	**Rs.**	**Income**	**Rs.**	**Rs.**
To Expenditure in respect of			By Rent* (Accrued/Realised)		00.00
Properties					
Rent, Taxes, Cases			By Interest* (accrued/realised)		
Repairs and Maintance			On Securities		
Salaries			On Deposits	210,825.84	
Depreciation (by way of prov. or adjustment)		00.00	On Loan		
Other expenses			On Bank Account	304.00	211,129.84
To Establishment Expenses			By Divident		
To Renumeration to Trustees			By Donation in cash or kind		
To Remuneration (in the case of Math) to the head of Math including his household expenditure			By Grants (Publication)	36,000.00	36,000.00
			By Income from other sources in details as far as possible		
To legal fees					
To interest paid			—Conference Grant Received	59,000.00	
To Audit fees		2,000.00	Life Membership Fees	32,000.00	
To Contribution and Fees			M&E Volume sale	54,440.00	
To Amount written off			Cost of DHP	00.00	
To Miscellaneous Expenses			Cost of Offprints	8,244.00	
To Depreciation		13,282.63	Institutional Subscription	00.00	
To Amount transferred to reserve or specific fund			Miscellaneous Income	00.00	153,684.00
To Expenditure on object of the trust (as per schedule 'A')		144,588.75			
To Establishment expenses		2,715.00	By Transfer from Reserve		
To Surplus carried over to B/S		238,227.46	By Deficit carried over to B/S		
Total Rs.		400,813.84	Total Rs.		400,813.84

As our report of even date

FOR A.S. CHANDVANKER & CO., CHARTERED ACCOUNTANTS

Date: 11.09.2002
Place: PUNE

A.S. CHANDVANKER

(P.K. Thomas)
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JOINT SECRETARY

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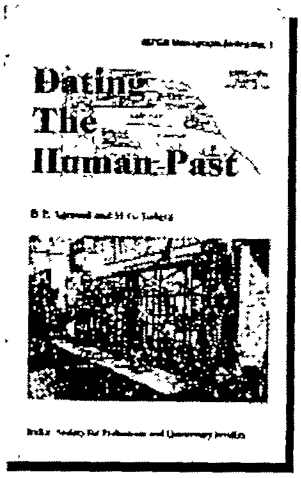

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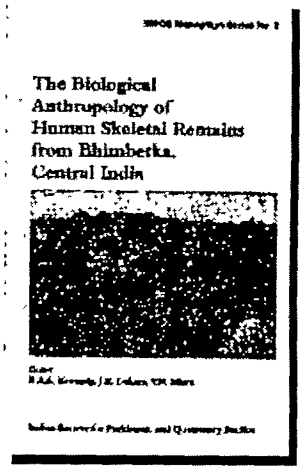

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